Subject Inspection of Science and Biology
REPORT

Coláiste An Chroí Naofa
Carraig na bhFear, Co Chorcaí
Roll number: 62130M

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REPORT ON THE QUALITY OF LEARNING AND TEACHING IN JUNIOR CERTIFICATE SCIENCE AND LEAVING CERTIFICATE BIOLOGY

This Subject Inspection report

This report has been written following a subject inspection in Coláiste An Chroí Naofa. It presents the findings of an evaluation of the quality of teaching and learning in Junior Certificate Science and Leaving Certificate 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 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

Junior Certificate Science is a core subject, which is to be commended. All junior Science classes have a weekly time allocation of one double lesson and two single lessons, which is within curriculum guidelines. On completion of the Junior Certificate students choose to do the optional Transition Year Programme or enter the established Leaving Certificate Programme. Entry into Transition Year is not automatic with interested students undergoing a selection process. A Science programme comprises part of the Transition Year programme, with students studying some Physics, Chemistry and Biology during their weekly-allocated double class. Currently the school offers Biology, Physics and Chemistry as optional subjects at Leaving Certificate level. Optional subjects at Leaving Certificate are in fixed blocks. Management stated that these blocks are reviewed every two years. The science subjects offered are located in different blocks, which does allow students to study all three sciences if required. Currently the majority of students study Biology with fewer than half studying Chemistry and a small number studying Physics. The time allocation is within curriculum guidelines, with five lessons, comprising one double and three single periods weekly, being allocated per subject. Student-based practical work is an important feature of both the revised Science and Biology syllabuses and the current provision of a double lesson each week for all groups facilitates the organisation of practical work as required by each syllabus, which is to be commended.

There are six teachers of science subjects in the school. At present there are two teachers teaching Leaving Certificate Biology. The school has three laboratories with a shared preparation or storage area connecting all three laboratories. This arrangement allows for the sharing of resources, which is to be commended. The majority of science classes take place in the laboratory with rotation when required for laboratory access between the teachers. The facilities are well maintained and are effective for the delivery of science subjects. The storage or preparation area observed was well organized with clear evidence of a lot of thought having been
put into this space by the science staff. This is to be commended. A laboratory folder was presented. This could be further developed into a scheme for recording and re-ordering of materials and equipment in terms of breakages and for stock control. Considerable work on the storage of chemicals according to the different storage groups has been implemented and is to be commended. It is recommended that each chemical be marked with the correct colour code in order to facilitate correct storage on a continuing basis. Information on the storage of chemicals can be obtained on the physical sciences website, [http://www.psi-net.org/chemistry](http://www.psi-net.org/chemistry). The school has a health and safety Statement, which is currently being reviewed. Copies of the published guidelines on safety – Safety in School Science and Safety in the School Laboratory published by the Department of Education and Science in 1996 are available. Further copies if required can be downloaded from the Internet at [http://www.psi-net.org/chemistry](http://www.psi-net.org/chemistry).

The provision of resources for the teaching of the sciences is very good. Resources such as a computer and data projector were observed in each laboratory, which is to be commended. In addition the science staff has access to the use of overhead projectors, television, and video. Some of these are also permanent resources within the science facilities and will support the teaching and learning process. A yearly budget is also allocated by management for the upkeep and development of the sciences in the school, which is to be commended.

The laboratories had some colourful visual stimuli mainly in the form of charts, diagrams and models. Some of this visual stimulus-material was of student origin, which is to be commended. Its presence helped to enhance the laboratories and with regular updating should help to maintain the interest and stimulation of the students. The use of display boards, which contain for example, charts, diagrams, displays of student work, recent science-related articles could also be considered. This could be further developed on display boards on the corridors near science laboratories as an initiative to raise the profile of the sciences in the school. A science display case was observed along one of the main corridors in the school. This is a good idea, as it will also help to promote Science, though to be effective it will require regular updating.

Opportunities for continual professional development currently in Science and previously in Biology and the Physical Sciences have been availed of and endorsed by management, which is to be commended.

Planning and Preparation

The school has been engaged in the process of school development planning. The science team have developed a science curricular plan for both junior Science and senior Biology students. This is to be commended. Management has facilitated this process with the allocation of four formal yearly planning meetings. Additional meetings have been sought this year by the science team and have been sanctioned by management to facilitate the organisation of the laboratories and the organisation and completion of the course-work component of the revised junior science syllabus. A formal subject convenor for Science is also present. This position rotates among the team yearly and is to be commended. In addition, a post of responsibility is attributed to one of the laboratories. Coordination and communication is also conducted informally among the teachers on an ongoing basis. In this way collaboration is established and maintained. Minutes are recorded for all meetings of the science team. Setting an agenda in advance could be considered for future meetings of the science team. Building on this planning, the science team could also consider how to share ideas for good practice, teaching resources, ideas for practical investigations, alternative forms of assessment and the integration of ICT.
In the classes observed there was evidence of short-term planning. This was evidenced by a familiarity with the subject matter, a coherent theme running through the classes, the prior preparation of the materials, and the apparatus required for student-centred investigative work. In addition, student learning was aided through the use of a variety of resources, which included the use of ICT for PowerPoint presentations, the use of textbooks, the use of the blackboard and the use of various types of handout material, which are to be commended. In addition, the individual planning material presented should also help to influence and direct the development of long-term planning for Science and Biology within the school. Discussion and reflection on the experiences gained through involvement with the revised syllabuses should also be a major influence of these plans. It is important to remember that any plan that is created will require regular review and should be modified to meet the students’ needs. The planning document should also highlight any further resource implications presented by the revised syllabuses and include procedures to acquire and access these resources in the future.

Opportunities to extend student learning outside the classroom have also been planned with visits to the Young Scientist and Technology exhibition, participation in *Women in Science and Engineering* at UCC and CIT, guest speakers to the school, projects, posters and participation by teams in the ISTA quiz. Such activities are admirable in fostering active participation and in developing an interest in the sciences and are to be commended.

**Teaching and Learning**

The classes observed had a disciplined atmosphere with a clear and fair code of behaviour. A positive teacher-student rapport was evident throughout the lessons, which is to be commended and this contributed to a constructive learning environment. Students were generally attentive, interested and anxious to participate well in the learning processes. Generally, students had a good understanding of the task in hand and displayed good teamwork skills in practical work. In general, there was an appropriate pace to the classes observed which facilitated student learning. Photosynthesis, viruses, extraction of plant pigments, bonding, magnetism and speed and acceleration were the topics of study in the lessons observed.

A range of teaching methodologies was observed, which included student practical work in groups, teacher demonstration, questioning, explanation, blackboard work, use of handouts and worksheets and ICT. Practical work was observed in a number of classes. Students worked in groups of two or three during all observed practical activity. Safety precautions were outlined to the students and reinforced by the teacher, which is to be commended. However, the location of student bags needs to be highlighted in all classes, especially when practical work is planned. The position of cables attached to some pieces of equipment would also need to be monitored during practical work to ensure the safety of all in the laboratory. In most instances students were able to set up, complete and clean up after their practical activity. This was very positive as the students’ skills were being developed. In one of the laboratories there is no water supply to half of the facility. Some strategies need to be put in place to avoid excess student movement during practical work when water is required. Students were focused on their tasks, especially when the allocated time for the completion of the practical investigation was short. However, it is important that students be given adequate time for completion of their practical investigation. During all the practical work observed, the teacher moved around the laboratory to provide guidance, feedback and deal with questions from the students regarding the investigation. This is very worthwhile and it also presents an opportunity to investigate the extent of students’ own understanding of the subject matter under investigation individually or within their groups, through observing and asking them questions on the work they were in the course of completing. The provision of a worksheet for the recording of findings or answering of related questions, for
example, could be considered in conjunction with some laboratory activities. This will help to focus the students on their task and ensure they are actively engaged while also helping to highlight potential difficulties they may be experiencing. Some observed practical work began with a degree of teacher instruction and demonstration and guidance. It is important that students get an appropriate level of instruction to complete the task(s). However, reference to actual results should be avoided at this time, as this is one of the reasons the students are engaged in the activity. Students could be asked for their opinion or hypothesis, which they can accept or reject, on completion of their practical investigation. The use of a plenary recall session near the completion of a practical class where students share and discuss their results and conclusions, under teacher guidance, could be considered. Students would become more actively engaged in their learning and could also help them to make a record of their own investigative work. This approach could also be adopted for example to summarise material delivered during a theory class.

Questioning to named students was observed and was used extensively during many of the classes observed with teacher affirmation and encouragement very much in evidence. This allowed previous knowledge and understanding to be evaluated and also aided the introduction and subsequent broadening of that topic, with appropriate linkages with other course areas, which is to be commended. Questioning varied in style and focus; however, many of the questions asked were at a factual level, testing knowledge recall only. As all classes observed were mixed ability, it is recommended that differentiation by questioning be employed to encourage the active participation of students who are less able and to provide a challenge for students who are more familiar with the subject matter. The use of more probing, higher order questions, with appropriate time allowed for answering, will assist the evaluation of the students’ level of understanding. Chorus answering to questioning should be discouraged as it is very difficult to know how well individual students understand the material. It is also important to ensure that all students are engaged through questioning at different points throughout the class to ensure that their learning does not become purely passive.

Whole-class teaching was observed at the start of all lessons visited, which helped to set the scene for the students. However, if the expected learning outcomes and objectives for the class were stated to the students it could help to focus their learning as it would be clear what is expected of them during the class. Whole-class teaching was also a feature of theory delivery in some of the lessons observed. The delivery of new information is important to student learning. However, it would be important to intersperse the teaching of theory between practical activities so as to reinforce the material taught and to maintain student engagement. This would be especially important during a double class. Whole-class teaching was also used effectively at the end of some of the observed classes. This helped to draw together key points under the guidance of the teacher, and was very effective.

Effective use was made of a range of relevant resources including PowerPoint presentations, student handouts, diagrams and the blackboard to enhance teaching and consolidate learning. Materials were clearly planned and presented to ensure student learning and retention. Though clear, the use of more colours on the blackboard should be considered in order to enhance students’ visualisation of the material. A lot of preparation time went into the development of the material, which was of great benefit to student learning, engagement, and understanding of the topics and is to be highly commended. Sharing of resources prepared by teachers, particularly in the area of ICT is to be encouraged to assure the quality of teaching and learning in Science and Biology. In order to ensure student engagement, over-reliance on any one method in the delivery of the subjects is not recommended.
The use of textbooks during classes was minimal, with teaching being actively carried out by the teachers. Textbooks were for the most part used as student background reading and for homework. This is to be commended. Consideration could be given to whether students have their textbooks or other material open during the delivery of new material and during the questioning of material. All students had laboratory notebooks or files in which they recorded all their investigative work. Some monitoring of student notebooks is noted and commended. When writing the procedures for practical work, students should be encouraged to use their own words rather than using the “recipe” in their textbooks or handout or as dictated by the teacher. Monitoring of this on a regular basis is to be encouraged to assure the quality of work presented by students and it will inform students of the need to make any required corrections to their work. The inclusion of practical work in the current scheme of assessment would be beneficial, as it would provide further motivation for engagement by all students with the practical element of the course. Homework given was appropriate to the lesson material and was designed to assist the student in learning and retaining the topic.

Assessment and Achievement

The students have a good attitude towards Science and Biology as displayed by the interest and level of engagement observed during classes. Formative assessment of the students is carried out on an ongoing basis by questioning in class, and by means of homework. However, to ensure that assessment of all students occurs, questioning of named students is recommended in order to prevent chorus answering. Formal assessments are held for non-examination classes at Christmas and summer. State examination classes have examinations in November and have mock examinations in the spring of their examination year. The teachers mark these scripts. Formal reports are sent to parents following November, Christmas, summer and mock examinations. In addition to reports, parent-teacher meetings are held for all classes annually.

Tests at the end of units are administered during lesson time at the discretion of the teacher. The science team could formalise the number of tests they will administer to their classes in each year group. This could be further developed to incorporate a method of continuous assessment. The inclusion of practical work in the scheme of continuous assessment is recommended, as it provides motivation for engagement by all students with the practical element of the course and ensures regular monitoring of student laboratory notebooks. This could be considered especially for students of non-examination years, acting as a stimulus for learning and a means of reward for hard work.

Summary of Main Findings and Recommendations

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

- There is a professional approach taken to the teaching of Junior Certificate Science and Leaving Certificate Biology in Coláiste An Chroí Naofa. This was evident from the level of individual preparation for the classes observed and the commitment displayed to the students.
- Science is afforded a high priority, as is evidenced by the range of science subjects offered at senior cycle and that Science is a core subject to Junior Certificate.
- In-school management is commended for the allocation of sufficient teaching time to allow the syllabuses to be effectively covered in each of the subjects.
• Classes observed were planned to ensure continuity and progression of work with careful advanced preparation of the required resource material.
• Opportunities for continual professional development in Science and Biology have been availed of and endorsed by management.
• ICT is available and integrated into the laboratories.
• Student practical work was observed with further evidence to be found in the student laboratory notebooks. Regular monitoring and annotation of this work will be very beneficial to student learning.
• The establishment of a science department structure with convenor is to be commended. Further information can be found on the internet at www.sdpi.ie
• The provision of an annual budget by in-school management for science is to be commended.
• Students have had opportunities to experience Science outside the laboratory through fieldtrips and attending various and varied science events.

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

• The planning work completed to date by the science department is to be commended. However, in the future items for consideration could include a policy regarding practical work, the use and monitoring of practical laboratory notebooks, assessment, and homework, future planning of courses and the number and type of assessments in each term for each year group. Further review, evaluation and adaptation of plans could occur annually.
• The science team might also look at the primary school Science syllabus and teacher guidelines, which will inform them of the level of Science the students are completing at this level.
• As an initiative to further raise the profile of science in the school, teachers should extend the displays of student work, recent science-related articles, the models and plant specimens in the laboratories to the display boards on the corridors near science laboratories.
• A collaborative and whole-school approach should be taken to the review and implementation of the school policy in the area of health and safety practices.
• An agenda should be set after collaboration between members of the science team before a formal meeting occurs, to ensure best use of the allocated time by management.

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.