Subject Inspection of Science and Biology
REPORT

Coláiste Bríde
Ennsicorthy, County Wexford
Roll number: 63570W

Date of inspection: 11 February 2011
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 Coláiste Bríde, Enniscorthy, conducted as part of a whole school evaluation. 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 received 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

Science is a core subject in the curriculum for Junior Certificate for first year only and it is optional thereafter. In the current second and third-year groups, approximately seventy two percent of students are studying Science. Within the optional Transition Year (TY) programme, Science is provided as a core subject. For Leaving Certificate, three senior science subjects; Biology, Physics and Chemistry are offered as optional subjects annually. Unfortunately, the numbers opting for Physics have been very low and for the past two years management had to make the decision not to timetable it. In the current fifth and sixth year, only Biology and Chemistry are provided on the curriculum. The uptake of Biology is very high at seventy percent in the current fifth and sixth year and the uptake of Chemistry is low at seven percent in each year. There are five class groups studying Biology and one class group studying Chemistry in both fifth and sixth year. The school has the personnel and resources to provide Physics for Leaving Certificate and endeavours to attract students to the subject annually. It is recommended that the school continue its efforts to restore Physics and to attract more students to Chemistry by building on students’ experiences of the sciences at Junior Certificate and TY and their promotion among students and parents.

With the exception of first year where there is a serious shortfall of time, appropriate 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 two periods and Biology is allocated five periods per week in both fifth and sixth year. These allocations meet syllabus recommendations. 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. This shortfall is not redressed over the three year programme. It is also a source of concern that first-year students only have contact with the subject once per week. Management’s rationale for the first-year curriculum is to allow students to study all subjects for one full 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.

Three laboratories are used for teaching and learning in the sciences. The demonstration room is
adjacent and is used at times for single lessons as it is unsuitable for student practical work. There
is sizeable demand on the three laboratories as there are thirty-two class groups for the sciences.
A rota for laboratory access is organised by teachers during a meeting at the start of each year.
Unfortunately, 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 endeavours to restrict the number of concurrent double lessons when formulating
the master timetable but achieving this is difficult due to the exigencies of school timetabling. For
the few class groups that are not scheduled for one weekly double lesson in a laboratory, teachers
coopoperate in making the necessary ongoing arrangements to exchange rooms from week to week
in order to enable mandatory student practical work to take place. This is not ideal and it is
recommended that access to a laboratory for one double period per week for each class group
continue to be strived for.

On limited occasions, the laboratories are used by science teachers to deliver lessons in other
subjects. Teachers endeavour to ensure that science lessons receive absolute priority over any
other subject. This should continue to be unconditional.

Very good facilities are in place for the use of information and communication technology (ICT)
by teachers. Data projectors are installed enabling text-based as well as audio-visual displays of
teaching resources and most teachers use portable laptops. Teachers make extensive use of ICT to
plan lessons and to source ideas and visual material. A very good range of resources for teaching
and learning in the subjects has been built up. The pool of resources is accessible in a shared
folder on the school’s intranet. Teachers also use ICT applications to develop fresh approaches;
some contemporary work has led to the development of student-created podcasts and the science
department’s own virtual learning environment (VLE). Some teachers utilise this facility to post
class notes, very useful revision exercises and assignments for students. These developments are
commended.

Data logging equipment is available in the school. While it is used mainly in Chemistry and
Physics, profitable use is made of the technology in ecology field work. Other ways in which the
equipment could be used in Science and Biology were discussed during the evaluation and this is
recommended for future student laboratory work.

The subjects are well resourced for student practical work and the purchasing of stock is
collaboratively arranged by teachers with good financial support from senior management. Some
stock enhancement may be necessary to ensure at least twelve sets are available for each of the
prescribed student practicals; for example, additional sets may need to be purchased for the
preparation of gases by students. Storage is well managed in the spacious preparation rooms and
resources are organised for ease of access. It is advantageous that there is separate access to the
preparation rooms for teachers.

The science department demonstrated a progressive attitude and an interest in participating in
opportunities for continuing professional development (CPD). Senior management supports this
and also supports membership of professional organisations. In-service courses in the revised
syllabuses were attended and the benefits of these were evident in teaching and learning.
Management arranges whole-staff CPD annually and recently this has included training in ICT.
Some members of the science department are engaging with additional CPD in the areas of differentiation and ICT. Such participation is very beneficial and is having a positive impact on the whole department. It was evident that teachers disseminate information from these courses to each other and support one another in planning for lessons. It is recommended that arrangements for the dissemination of the learning in these areas among all members of the science department be formalised.

Students are assigned to class groups in the sciences for junior and senior cycle on the basis of mixed ability and this is good practice for the subjects. It is suggested that additional provision could be made by senior management and teachers to support teaching and learning in this arrangement. This could take place through focused in-service on differentiated teaching and learning with the whole staff, or alternatively, within the science department through the aforementioned formalisation of the dissemination process. It was reported that science teachers liaise with the learning-support staff in the provision of subject-specific supports for students with special educational needs in a manner that supports scientific literacy and the application of students’ learning in Science. This merits on-going focus and development and concrete examples of how this might be achieved for students with resource hours were put forward by teachers during the evaluation.

The laboratories presented as stimulating learning environments. Displays of science-related material in the laboratories and on the science notice board in the corridor include material on careers in the sciences as well as articles of interest to students. The science department facilitates co-curricular activities for students in support of science education including the many valuable and fun promotions that take place during Science Week.

A previous subject inspection in Science and Chemistry was conducted in 2003. Almost all of the recommendations made in that report have been addressed. However, the shortfall in timetabling for Science in first year remains.

**PLANNING AND PREPARATION**

The level of planning and preparation undertaken by science teachers is very good. They collaborate on many matters and take shared responsibility for organisation and development of the subjects and facilities. The science department meets formally on three occasions per year and this is facilitated by management. Within the science department, roles have been agreed and delegated to each teacher for certain tasks and this division of labour was seen to be facilitating development of the subject. A solution-orientated approach was noted in much of the work undertaken to date. A review of the agendas and minutes of meetings reveal discussions and progress on a wide range of matters. In order to further support progression, it is suggested that one item on the agenda for each meeting should relate to teaching and learning. This would ensure discussions always extend to pedagogy and would provide challenge and stimulus for teachers and ultimately for students. While there is evidence of good management within the subject department, it is suggested that there is an opportunity for leadership development for staff members and consideration should be given to nominating a subject department leader on a two-year rotational basis.

Subject planning is well developed and subject plans are reviewed on a cyclical basis. In addition to agreed organisational arrangements, subject plans outline approaches to teaching, assessment, record keeping and safety. It is recommended that student investigation be included in the list of teaching and learning methodologies in the science plan and that the use of demonstration be
clarified. As part of the subject plan for Science, common programmes of work have been developed for year groups and teachers use these as a basis for lesson planning and the setting of common assessments for year groups in the formal school examinations. This is good practice. The programme of work for first year justifiably includes topics that provide students with a good experience of the subject and a foundation in skill development in practical work so that they are best encouraged to choose the subject in second year. It is good that revision time is built into the programmes of work.

The curriculum plan for Science is laid out in a table that integrates topics with student learning outcomes and methodologies. Some development is still necessary in the column for homework and also in matching the exact verb in the learning outcome with that prescribed by the syllabus. To further embed the investigative approach to teaching Science, it is recommended that discussions take place as to how best to facilitate this approach in a consistent manner with all class groups studying Science where the objectives for the work are set out beforehand with the class and students are given the opportunity to plan their approach to the investigation. As required, teachers are directed to the Guidelines for Teachers for further guidance on the development of this technique. In addition, and to ensure that the subject plan becomes a tool for effective practice, it is recommended that syllabus learning outcomes be shared with students in lessons and also be used to evaluate learning. This strategy was observed in some lessons visited and should be extended to all classes.

The TY plan for Science outlines good objectives and methodologies for students’ experience of Science. A set of resources to match the course has been developed and this is stored centrally for all to use. This includes some good modules in Health, Forensics and Cosmetics. Some revisions to the curriculum content of the TY science plan should take place to reduce the amount of topics from Leaving Certificate syllabuses to the minimum level sufficient to give students a flavour of the subjects in senior cycle. Other more diverse topics that could be included in TY Science were discussed with the team of teachers during the evaluation including those with an interdisciplinary and cross-curricular nature and these should be considered. In addition, it is recommended that the approach taken to teaching any module included in TY Science be evaluated for its merits in promoting student self-directed learning, problem-based learning and the development of a diverse range of student skills. In addition and as already indicated, it would be opportune to further promote students’ learning experiences in Physics and Chemistry at this point.

High levels of preparation took place in advance of lessons visited. ICT presentations, handouts and equipment for practical work were organised in advance. Commendably, lesson preparation extended to planning for the inclusion of tasks and group work. In a few instances, it would have been beneficial to have additional sets of equipment for prescribed student practical work to hand to allow groups of students to conduct practical work simultaneously, rather than having to take turns.

TEACHING AND LEARNING

Nine lessons were observed during the subject inspection. The quality of teaching and learning observed was generally good and a few instances of excellent practice were noted.

All lessons were characterised by a positive learning atmosphere. Classroom management was effective. Lessons clearly fitted in a sequence or plan and had good pace and structure. An appropriate amount of material was covered in all lessons. The lesson topic was contextualised and related well to students’ lives and interests. A range of methods and approaches was observed
during the subject inspection. In most instances, teachers incorporated a variety of student activities into the structure of the lesson. Instances of active student learning included practical work, group work, note making and other tasks. These instances enabled students to access and develop a range of skills and are commended.

Well-established routines were followed in lessons and students knew what was expected of them and what was to be achieved in their lessons. Good practice was noted in lessons where the level of challenge for the individual student was not foreseeable and students had to remain alert for teacher questioning, task assignment or ongoing note making. In a few instances, however, classroom routines were overly predictable and some students were seen to be periodically unforthcoming or inactive. The best evidence of learning was observed when all students were challenged and engaged, and when they displayed an active involvement in and a sense of responsibility for their own work. This finding merits some consideration among the subject department and ways in which teaching and learning methodologies can become more varied ought to be considered. With appropriate planning, strategies such as unexpected quizzes, games, peer tutoring, student presentations, peer correction of homework and other forms of co-operative learning merit investigation and application from time to time.

Questioning was most effective where a mix of global and directed types were used, sufficient time and prompts were given, and where a percentage of questions promoted the development of higher-order thinking skills. In many instances, very good differentiation was noted in the questioning where students were challenged according to individual potential. When challenged, students engaged very well and there was evidence of good learning from their responses and from observations made on the quality of their written work. Students demonstrated good levels of competence in each curriculum area with exemplary qualities noted in a few class groups.

Teachers made appropriate and ongoing use of the board to display ICT slides, note key words and display diagrams. In the main, ICT presentations were well designed presenting information, good visuals and summaries for reinforcement of key points. In one lesson, the intended learning outcomes of the lesson were presented at stages with tasks integrated to assess the achievement of those learning outcomes by students. In isolated instances, teacher-led ICT presentations and instruction dominated the mode of lesson delivery and there was a lack of productive circulation among students. In most instances, however, the use of teacher circulation was excellent and frequent; in these instances circulation was used to provide attention to the individual during teacher monitoring of tasks, one-to-one interactions and the application of formative feedback on written work.

A particular strength noted in one lesson visited was the use of the board to record responses made by students to skilful teacher questioning in a way that built an organised structure of the complete concept and links to other biological concepts. The practice of note building and attention to detail by the teacher led to similar qualities in students’ copybooks which demonstrated clear organisation and structure including learning at a deep level. This methodology could be extended to other class groups to encourage good note-making habits. There was evidence in this class group of particularly in-depth and accurate understanding of the subject including the inter-related sub topics. It is noteworthy that in this class group, a high level of developmental feedback is given to students on a weekly basis through class tests or written assignments and that the students were particularly attentive to suggestions for improvement given by their teacher.

In all classes, students were making good progress with prescribed student laboratory work and high standards were evident in students’ laboratory notebooks, including commendable field
ecology reports. Student practical work that was observed was well organised and engaged the students. The investigative approach to practical work in Science was very well applied in some lessons but less well so in others. As already indicated, this merits discussion at subject-department level so that implementation is consistent across all class groups. Consideration also needs to be given to the format of laboratory records for Science and this was discussed during the evaluation.

**ASSESSMENT**

Teacher questioning during lessons provided the basis for much of the teacher assessment of student progress. Homework and class tests are usually allocated regularly although the frequency of assignment of these varies between classes. Students complete their homework to a good standard and an appropriate standard was noted in the class tests observed during the evaluation. Strong focus is placed on preparation for the certificate examinations with the examination-year groups and very good use is made of questions from past certificate examinations papers in combination with marking schemes. Tests were mostly designed to match the format of the certificate examinations and this is good practice.

In some classes, student homework and written work is collected for assessment on a regular basis and corrected to a very high standard including the addition of beneficial formative comments and the application of a transparent marking scheme and grading. However, in other class groups there was found to be an over reliance on the correction of homework by the students themselves; most typically this is done during a plenary session held at the start of lessons. In some class groups, it was difficult to find any evidence of teacher correction on students’ written homework. It is recommended that agreement be reached among all members of the science department on the minimum standards for examining students’ written work with each year group in order to ensure greater consistency of experience across class groups in the subjects. In examining students’ written work, all teachers should use the principles of formative assessment. It may be useful to revisit the principles of assessment for learning (AfL) through in-service or to access information available on the AfL section of the website of the National Council for Curriculum and Assessment (NCCA).

The school’s homework policy includes guidelines and expectations of students regarding homework completion. It would be useful if either this policy or the section on homework procedures within the science plan could be expanded to include agreed procedures for examining homework by teachers including the frequency and types of correction to be applied to students’ written work.

**SUMMARY OF MAIN FINDINGS AND RECOMMENDATIONS**

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

- Subject planning is well advanced and the work of the subject department is collaborative and effective.
- The quality of teaching was generally good and instances of excellent practice were noted.
- The quality of learning was good and students demonstrated competence in each curriculum.
• In many instances, very good differentiation was noted and students were challenged according to individual potential; some excellent attention to students’ individual progress was evident during teacher monitoring of tasks, one-to-one interactions and the application of formative feedback on written work.

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

• The time allocated to Science in first year should be increased to four periods per week.
• Standards regarding the frequency and type of correction of students’ written work should be agreed by all members of the subject department and implemented consistently in all classes.
• Ways in which teaching and learning methodologies can become more varied ought to be considered at times, and with careful planning, opportunities for the use of co-operative learning could be extended.
• Discussions should take place at the subject department meetings as to how best to facilitate the implementation of the investigative approach to Junior Certificate Science in a consistent manner with all class groups.

A post-evaluation meeting was held with the principal and subject teachers at the conclusion of the evaluation when the draft findings and recommendations of the evaluation were presented and discussed.

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