Subject Inspection of Science and Biology
REPORT

Arklow CBS
Arklow
County Wicklow
Roll number: 61770U

Date of inspection: 1 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 Arklow CBS. 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 and with senior management. Following the evaluation visit, the inspector provided oral feedback on the outcomes of the evaluation to the principal and teachers. The board of management was given an opportunity to comment in writing on the findings and recommendations of the evaluation, and the response of the board will be found in the appendix to this report.

SUBJECT PROVISION AND WHOLE SCHOOL SUPPORT

Arklow CBS is a voluntary secondary school for males with a current enrolment of 244 students. Enrolments to the school have increased greatly in the last three years. The curriculum programmes on offer are the Junior Certificate, the Transition Year (TY), the Leaving Certificate and the Leaving Certificate Vocational Programme (LCVP).

The science subjects are strongly promoted and have a high profile on the school curriculum. Science is a core subject for all junior cycle students in first, second and third year. For Leaving Certificate, Biology and Physics are well established on the curriculum and there is one class group for each in the current sixth year with good student numbers in both subjects. The arrangement of subject blocks allows students to study both subjects. Currently, the school has no fifth year cohort due to this year’s introduction of TY as a compulsory programme. Management is making plans for the facilitation of a large fifth year group in the coming school year and intends to take that opportunity to offer Chemistry as a third science option. The school has the staffing qualification and capacity to provide for expansion in the sciences. Biology and Physics are both provided as subjects in the TY programme to enable students to sample the subjects at senior cycle prior to making choices for Leaving Certificate. It is good that teachers have plans in place to introduce elements of Chemistry into the TY sciences.

Good provision is made for Junior Certificate Science in second and third year, as four periods are provided per week and this meets syllabus recommendations. Provision in first year is less satisfactory with only three periods provided. It is recommended that the expansion of provision for Science be given due consideration each year in whole-school discussions on the rationale for the structure of the first-year curriculum. Good provision is made for the sciences throughout senior cycle and Biology is allocated five periods per week for Leaving Certificate. This meets syllabus recommendations. Timetable allocation to all the sciences in each year includes one double period and this is in line with best practice. Classes retain the same teacher from year to year within cycles.

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. Very good provision is made by senior
management and teachers to support teaching and learning in this arrangement. For example, recent staff in-service focused on differentiated learning and this was followed with the introduction of differentiated learning outcomes into the subject plan for Science. Science teachers also liaise with the learning-support staff in the provision of more specialised supports for students with special educational needs in a manner that supports inclusive practices in science lessons. This is good and merits on-going focus and development; for example, practice could extend to documenting the intended outcomes of in-class support for individuals. In addition, plans are in place to extend methodologies for those students who are gifted and one teacher is currently developing this aspect. It is noteworthy that a recent whole-school review set the pursuit of excellence in learning as one of the three priorities for strategic development over the next three years.

Good facilities are in place to support the delivery of the subjects, including two large school laboratories. All lessons in the sciences are held in a laboratory. Infrastructural facilities for the use of information and communication technology (ICT) by teachers are very good. Teacher computers are networked, data projectors are installed and internet access is available. Science teachers make good use of ICT and endeavour to continually develop their skills in this area. The laboratories appear well-resourced in terms of equipment for practical work and other audio-visual resources. It is advisable to remove some of the older or unused resources from time to time and keep modern posters displayed.

Management arranges whole-staff continuing professional development (CPD) events annually and most recently this has included the very valuable areas of ICT, special educational needs, school development planning, inclusion and the aforementioned in-service on differentiated learning outcomes. Members of the science department demonstrated a progressive attitude to professional development. Current additional education and training among science teachers include qualifications in management and planning. These are proving beneficial for the science department. Science teachers also availed of previously held in-service courses in the syllabuses.

Extracurricular activities in the sciences are promoted. For part of the year, science teachers run a robot club at lunchtimes, mainly for junior students, and the additional funds for this are provided by the parents’ council. The school has achieved notable successes in some national science-related competitions over the years. Links have been established with chemical industries within the community and guest speakers with roles in the sciences and engineering.

A previous subject inspection in Science and Physics was conducted in 2005 and all recommendations made in that report have been addressed.

**PLANNING AND PREPARATION**

Subject department planning is well established and facilitated by management. Recently, the principal set standards for subject department planning and ensured consistency by directing the focus of meetings through the use of review templates; this year planning for each subject was reviewed according to the set aspects of curriculum content, resources, subject policies and procedures, teaching and learning, literacy and numeracy, and student attainment. This was completed for Science, Biology and Physics and has provided science teachers with very useful information on what has been achieved and what still needs to be done in planning for the subjects. The next intended focus of school development planning is a review of learning attainment levels of each year. The whole-school aspects of subject planning are commended.
Subject plans have been developed collaboratively for each of the sciences within each curricular programme. These too are very well-developed documents, outlining agreed procedures in all necessary areas; for example, a list of appropriate teaching and learning methods is included as well as procedures for homework and assessment. The curriculum plans for Science and Biology integrate learning outcomes or topics with a system of assessment. The curriculum plans also provide for the completion of the higher-level syllabus and for a very good amount of time for revision at the end of the cycle. As an outcome of the training for teachers on differentiation, the curriculum plan for Science was differentiated to include what students should, could and must be able to do in terms of learning outcomes. This provides very valuable guidance for teachers in adapting the lesson plans to the abilities of individual students. Subject plans also outline strategies for planning for students with special educational needs but this may need some development in practice. This is an area where a bank of resource material could be built up over time for each topic and stored centrally for all teachers to add to and draw from. Subject plans, review documents, meeting minutes and electronic subject resources are all kept centrally on the computer network.

A subject plan for TY Biology has been developed. The curriculum content of this plan should be revised as many topics feature on the Leaving Certificate syllabus. Possible and diverse areas of study could include those of an interdisciplinary and cross-curricular nature and some of these were discussed with teachers during the evaluation feedback. It is also recommended that the current list of teaching methodologies be revised and consideration be given to methodologies that enable the development of a broader range of student skills, such as those developed through problem-solving, self-directed learning and co-operative learning.

Planning for all lessons observed was good. Lessons included the integration of well-prepared practical work and teacher presentations.

**TEACHING AND LEARNING**

Two double lessons and two single lessons were observed during the evaluation. Lessons covered topics such as light, density, solubility and homeostasis. All lessons had good structure and pace. In most lessons, considerable focus was placed on preparation for the state examinations in the subjects and teachers had begun a phase of revision for the mock examinations.

The quality of teaching and learning was good with good practice noted in the area of differentiation and teacher circulation. However, in order to build on the very competent learning presented and to further meet all learning styles, the range of teaching and learning methodologies could be varied and broadened. Opportunities could be provided for more co-operative learning and self-directed learning through the periodic employment of strategies such as pair work, student note making, discussions, peer instruction and peer assessment.

All teachers used ICT presentations and worksheets appropriately to enhance learning. The board was used very well by teachers to build diagrams and note key words on topics during lessons. Text books were used appropriately as reference points for students. Lessons were interesting, topics were contextualised and the subject matter was made relevant to everyday life.

During their lessons, students responded productively to teacher questions, demonstrating a good level of competence in the curriculum and a willingness to learn. Students were very well behaved, concentrated fully and answered all questions posed to them with clarity and confidence. An atmosphere of trust and very good rapport was established.
Class groups incorporated a range of student ability. In the main, lessons were delivered in a way which maximised student participation in the lesson and there was a reasonable level of challenge for individual students. The use of differentiation was evident in the well-chosen written tasks assigned to students and in most of the teacher questioning. During the lessons observed, teachers took time to circulate effectively among students, interacting with them as individuals and monitoring their progress. This was particularly well applied during plenary corrections of homework when ensuring individual students had accurately recorded the correct answer.

Effective questioning to named students was employed to reinforce the subject matter and continually engage students in recall. However, at times during teacher questioning, teachers could have expected longer answers or more detail from students, particularly at higher level. It is worth considering how more time could be given to students to formulate more complex answers. Strategies could include encouraging the group to build on each others’ answers or to express opinions through argument or discussion. This is an area for development that could be approached through subject department discussions on methodologies.

Many of the examination class groups had considerable amounts of work built up in student copies and laboratory reports. It was clear, from questions posed by the inspector on this written work, that a good level of learning had taken place and that this was appropriate to their abilities. A first-year group, however, had covered a modest amount of material to date because of loss of instruction time due to the reduced timetable in first year, and school closure in recent adverse weather. Work needs to be done to consolidate this group’s learning in Science by the end of the year. Students’ written work in other class groups was not satisfactorily maintained, apart from their laboratory records; in these instances students did not keep copybooks but relied instead on handouts and worksheets which were not being kept neatly or in any organised format. This system should be reconsidered. Structure and organisation should be expected of all students’ written work so that a body of work is built up over time and used by students for reference and revision and by teachers for monitoring and assessing students’ progress.

It was clear from observation of students’ skills and laboratory notebooks that lessons throughout the year in Science and Biology are given a practical focus. Student practical work that was observed was well organised and engaged the students. Students keep detailed records of all laboratory work and this is good practice. It was noted, however, that the work in students’ laboratory reports was not always neatly presented, especially the apparatus diagrams. Students should be expected to draw diagrams in pencil using a ruler. The quality of presentation could be developed through teacher monitoring and constructive written feedback that encourages progression. This approach is recommended for all groups, particularly since students are awarded merit marks for their laboratory work.

In many lessons, good support was given to the investigative approach to learning Science at junior cycle, as appropriate to the syllabus. Students were observed being skilfully led through a logical pattern of decision-making to arrive at a particular procedure, thereby avoiding teacher demonstration or reliance on procedure printed in the books. Teachers are directed to the *Guidelines for Teachers* if further guidance on the development of this technique is required.

**ASSESSMENT**

Assessment of student learning is achieved using teacher questioning, homework, the administration of class tests and twice-yearly formal school examinations. All students should keep their tests in a folder and consideration could be given to the use of progress charts. In most instances, teachers applied the transparent use of state examinations marking schemes when
assessing performance on questions from past examination papers in class tests and the correction of homework. It is recommended that this be more firmly embedded in practice with all class groups. Similar to the state examinations allocation of marks for Coursework A in Junior Certificate Science, a percentage of the grade allocated on formal school examinations is given for student laboratory work. It is recommended that evidence of this assessment be shown in student laboratory notebooks.

Good formative feedback was given to students during questioning and there were instances where good advice was given to students on how to construct good laboratory reports.

Formal school tests are held at Christmas and summer for non-examination groups, and mock examinations are held for the examination classes. Reports on student progress are sent home to parents following the formal tests.

The school conducts a subject specific analysis of the certificate examination results and compares these results against national norms for boys. This is beneficial. The use of this analysis to inform planning is good practice and is encouraged.

SUMMARY OF MAIN FINDINGS AND RECOMMENDATIONS

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

- The science subjects are strongly promoted and have a high profile on the curriculum.
- Very good provision is made to support teaching and learning in the mixed ability setting.
- Subject department planning is effective and subject plans are well advanced.
- The quality of teaching was good and included examples of good use of differentiated teaching strategies and effective teacher circulation.
- The quality of learning was good and students participated productively in their lessons, demonstrating a good level of competence in the curriculum and a willingness to learn.

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

- Consistently good standards should be expected from students in the presentation and organisation of their written work.
- Students should be encouraged to develop more extended responses to questioning.
- Science teachers should further develop the range of teaching and learning methodologies to include opportunities for self-directed learning and co-operative learning.
- The content and methodologies in the TY plan for Biology should be revised.

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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Appendix

School response to the report

Submitted by the Board of Management

Area 1: Observations on the content of the inspection report

The school policy has always been to offer all 3 science subjects, Physics, Biology and Chemistry at senior cycle and each class formers according to student choice and appropriate numbers in each.

Although the TY Biology Plan does not specifically include the teaching methodologies mentioned these are routinely used with students. These teaching and learning methodologies (cited in the report) are regularly and routinely employed by teachers but were not amongst the methodologies used on the day of the inspection. The subject plan for Junior Certificate Science includes a comprehensive list of methodologies used and includes peer tutoring and student group work which are similar methodologies to those suggested in the report.

Although our Junior Certificate Science Plan does not specifically use the terms ‘self-directed learning’ and ‘cooperative learning’ it does include similar methodologies such as peer tutoring, project work, quiz activities, problem solving, structured discussion, student group work and student investigations.

Area 2: Follow-up actions planned or undertaken since the completion of the inspection activity to implement the findings and recommendations of the inspection

The content and methodologies in the TY plan for Biology are currently being revised.