Looking at Biology

Teaching and Learning in Post-Primary Schools
The Inspectorate wishes to thank the following schools for permission to use photographs:
St Caimin’s Community School, Shannon, Co Clare
St MacDara’s Community College, Templeogue, Dublin 6W

© 2012 Department of Education and Skills
PRN: A11/0615

Designed by www.slickfish.ie

Published by
Evaluation Support and Research Unit
Inspectorate
Department of Education and Skills
Marlborough Street
Dublin 1

This report and others in the series may be accessed at
www.education.ie
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>ii</td>
</tr>
<tr>
<td>1 Context of this report</td>
<td>1</td>
</tr>
<tr>
<td>2 The quality of subject provision and whole-school support</td>
<td>6</td>
</tr>
<tr>
<td>3 The quality of planning and preparation</td>
<td>16</td>
</tr>
<tr>
<td>4 The quality of teaching and learning</td>
<td>24</td>
</tr>
<tr>
<td>5 The quality of assessment</td>
<td>38</td>
</tr>
<tr>
<td>6 Summary of main findings and recommendations</td>
<td>46</td>
</tr>
<tr>
<td>Appendix</td>
<td>53</td>
</tr>
</tbody>
</table>
Foreword

This composite report provides a detailed insight into students’ experience of Biology in the senior cycle. It provides an analysis of the quality of teaching and learning arising from fifty-seven subject inspections carried out between the 2006/07 and the 2009/10 school years. It deals with evaluations of biology lessons in the established Leaving Certificate (LC), within the science elective of the Leaving Certificate Applied (LCA) programme and courses of Biology within the Transition Year (TY) programme, each of which provide a continuation of the knowledge and skills learned by students during junior cycle Science and primary school Science.

The report provides analysis and commentary on the quality of teaching of Biology and the standards of learning achieved by students in the subject. It affirms the many good practices observed by inspectors in biology classrooms and it highlights a number of areas for improvement in the teaching and learning of Biology across all programmes at senior cycle.

There has been considerable success in implementing the current LC Biology syllabus, which was introduced into schools in 2002. Significant changes acknowledged in this report include the increase in the number of students nationally choosing both the subject and the higher-level option, the beneficial impact of the in-service for teachers, and the benefits derived from the increasing use of information and communication technology in preparing and teaching lessons. The proficiency of biology teachers in developing students’ ability to make informed evaluations about contemporary biological issues and the strongly positive findings relating to the implementation of a course of laboratory work and fieldwork for students are also highlighted. The report contains examples of a high level of innovation in the design of courses for Biology within TY, a programme which promotes the development of a wide range of transferable skills. The report comments on good practice in the development, during the LCA programme, of students’ scientific literacy and the emphasis on highlighting the relevance of Biology for students in their everyday lives.

The study of Biology at second level provides students with the knowledge, skills and understanding to pursue further education and employment in scientific or biology-related fields. It enables them to fulfil their own potential and to contribute to sustained economic development.
It is intended that this report will be of interest to all teachers of Biology and will assist school managements, subject departments and teachers in planning, self-review and improving the quality of teaching and learning of the subject. I hope the report will also be of value in informing policy in curriculum and assessment, teacher professional development and school self-evaluation.
Chapter 1

Context of this report

1.1 Introduction

This report is based on an analysis of reports arising from subject inspections conducted by inspectors of the Department of Education and Skills in fifty-seven post-primary schools in the period 2006 to 2010. The report describes and evaluates the current practices relating to the teaching and learning of Biology at senior cycle in post-primary schools. The biology lessons that were evaluated spanned the established Leaving Certificate (LC), the science elective of the Leaving Certificate Applied (LCA) programme and the Transition Year (TY) programme.

The reports that were analysed resulted from inspections carried out either as part of a whole-school evaluation (WSE) or as stand-alone subject inspections. The sample of subject inspection reports used as the basis for this report reflects the types of post-primary schools within the school system and includes a range of urban, rural and suburban schools across the country. The categories of schools are shown in the tables on this page:

<table>
<thead>
<tr>
<th>School type</th>
<th>Number</th>
<th>Percentage of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voluntary post-primary schools</td>
<td>28</td>
<td>49%</td>
</tr>
<tr>
<td>Vocational Education Committee (VEC) schools</td>
<td>20</td>
<td>35%</td>
</tr>
<tr>
<td>Community and comprehensive schools</td>
<td>9</td>
<td>16%</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School size</th>
<th>Number</th>
<th>Percentage of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fewer than 200 students</td>
<td>6</td>
<td>10%</td>
</tr>
<tr>
<td>From 200 to 500 students</td>
<td>22</td>
<td>39%</td>
</tr>
<tr>
<td>More than 500 students</td>
<td>29</td>
<td>51%</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Schools by sex</th>
<th>Number</th>
<th>Percentage of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-educational schools</td>
<td>32</td>
<td>56%</td>
</tr>
<tr>
<td>Single-sex girls’ schools</td>
<td>12</td>
<td>21%</td>
</tr>
<tr>
<td>Single-sex boys’ schools</td>
<td>13</td>
<td>23%</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>100%</td>
</tr>
</tbody>
</table>
1.2 Structure and purpose of this report

Looking at Biology reflects the subject inspection evaluation framework as set out in *A Guide to Subject Inspection at Second Level* (Inspectorate, 2004). It examines and analyses the findings and recommendations of the fifty-seven subject inspection reports under the headings of:

- the quality of subject provision and whole-school support
- the quality of planning and preparation
- the quality of teaching and learning
- the quality of assessment.

This publication is intended as a resource for teachers, school authorities and policy-makers. Its purposes are to:

- evaluate the quality of teaching of Biology and the standards of learning achieved by students in the subject as observed by inspectors during the course of their inspection work
- identify areas for improvement in the teaching and learning of Biology
- affirm and highlight good practices
- assist school managements, subject departments and teachers in self-review and in improving the teaching of the subject
- inform and encourage professional dialogue concerning the teaching of Biology
- inform school support services on the impact of their support programmes and aspects of the subject that need further support.

<table>
<thead>
<tr>
<th>Quantitative terms used in the report</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost all</td>
<td>Greater than 90%</td>
</tr>
<tr>
<td>Most</td>
<td>75% - 90%</td>
</tr>
<tr>
<td>Majority</td>
<td>50% - 74%</td>
</tr>
<tr>
<td>Fewer than half</td>
<td>25% - 49%</td>
</tr>
<tr>
<td>A small number</td>
<td>16% - 24%</td>
</tr>
<tr>
<td>A few</td>
<td>Up to 15%</td>
</tr>
</tbody>
</table>

1.3 Biology in the post-primary curriculum

During the Transition Year programme, many schools offer short courses or modules of Biology or topics relating to the applications of Biology, either as a component of a course in Science or as a stand-alone course. Within TY, schools can devise their own unique programme for Biology. The Department’s guidelines for the TY programme encourage the use, by students, of project work and portfolio work as well as its exhibition in the school. The TY programme offers the opportunity to use a variety of assessment modes including, for example, continuous assessment.
The current Leaving Certificate biology syllabus was introduced in schools in 2002 and was examined for the first time in 2004. The principles, procedures and concepts of Biology constitute approximately 70% of the syllabus and the technological, political, social and economic aspects of the subject comprise the remaining 30%. Contemporary biological issues and the interface of Biology with technology feature throughout the syllabus, which also emphasises the scientific method. In addition, the syllabus promotes the acquisition of practical skills through a course of laboratory work and fieldwork. The syllabus is designed for approximately 180 hours of class contact time over two years of study. Students are formally assessed on completion of their study through a terminal written examination paper. Many students who take Biology for the Leaving Certificate do so within the Leaving Certificate Vocational Programme (LCVP) as the subject is in the list of qualifying vocational subject groupings.

While the Leaving Certificate Applied programme does not include Biology as a distinct subject, the four modules in the LCA science elective contain many biological aspects and the elective is studied in 36% of schools providing the LCA programme. The modules focus on issues of relevance to the student, such as health, food, and consumer issues. Just as for the established Leaving Certificate, the approach to biological topics reflects a scientific approach that involves researching issues using practical work in the laboratory, fieldwork and the use of information and communication technology (ICT).

1.4 National participation rates in Biology

The uptake of Biology as a Leaving Certificate subject has increased significantly and this has coincided with the introduction of the revised syllabus. Almost all (91%) students in post-primary schools study Science for Junior Certificate and at senior cycle, students who take a science subject in the Leaving Certificate are most likely to choose Biology. Biology is provided by almost all (97%) post-primary schools. Statistics, based on returns made to the Department, reveal that in the 2009/10 academic year, 57% of the total cohort of Leaving Certificate students in all post-primary schools took Biology and this compares with 43% who chose it in 2001/02. The increasing rate of uptake of Biology by students for the Leaving Certificate is shown in fig. 1.1, on the next page.
Fig. 1.1: Percentage of students in all post-primary schools taking Biology in the Leaving Certificate

Table 1.1 compares the relative percentages of candidates taking Biology in the ordinary-level (OL) and the higher-level (HL) Leaving Certificate examinations from 2001 to 2010, as published by the State Examinations Commission. Since 2004, when the first examination in the revised syllabus was held, the proportion of students taking Biology at the higher level has increased steadily every year to the current rate of 71.7% of the total cohort taking Biology and correspondingly, at the ordinary level it has declined to 28.3% of the total cohort.

<table>
<thead>
<tr>
<th>School year</th>
<th>% OL</th>
<th>% HL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000/01</td>
<td>39.4</td>
<td>60.6</td>
</tr>
<tr>
<td>2001/02</td>
<td>37.6</td>
<td>62.4</td>
</tr>
<tr>
<td>2002/03</td>
<td>39.2</td>
<td>60.8</td>
</tr>
<tr>
<td>2003/04</td>
<td>33.3</td>
<td>66.7</td>
</tr>
<tr>
<td>2004/05</td>
<td>31.1</td>
<td>68.9</td>
</tr>
<tr>
<td>2005/06</td>
<td>31.5</td>
<td>68.5</td>
</tr>
<tr>
<td>2006/07</td>
<td>32.1</td>
<td>67.9</td>
</tr>
<tr>
<td>2007/08</td>
<td>31.1</td>
<td>68.9</td>
</tr>
<tr>
<td>2008/09</td>
<td>28.5</td>
<td>71.5</td>
</tr>
<tr>
<td>2009/10</td>
<td>28.3</td>
<td>71.7</td>
</tr>
</tbody>
</table>

Leaving Certificate Biology is chosen by a diverse range of students with very different career or third-level pathways in mind. Given the large number of students who choose to study Biology nationally and the fact that the group encompasses a particularly broad range of abilities, interests and needs, it is very encouraging that there is such a sizeable uptake of the subject at the higher level and this bodes very well for the future of the subject.
Chapter 2

The quality of subject provision and whole-school support
2.1 Students’ access to Biology

Inspectors found that the availability and provision of Biology in Transition Year was very good: all of the schools that provided a TY programme included Biology in the programme. In the majority of instances, Biology was included as a modular component of a science programme. Other arrangements included providing Biology as a subject for the whole year or a series of short biology-related modules of various types.

In all of the schools, large numbers of students selected Biology for the Leaving Certificate. The subject was always a viable option in the range of subjects offered for the Leaving Certificate. The inspectors identified good practice in the area of subject choice in almost all the schools, where subject option blocks were tailored to best fit the preferences expressed as an outcome of an annual survey of students. In a few instances, schools applied restrictions by asking students to select their subjects before commencing Transition Year and to carry them through to the Leaving Certificate. This practice should cease as it is contrary to the principles of the TY programme. TY is a distinct programme and should not constitute the first year of a three-year Leaving Certificate. For example, one report advised:

Leaving Certificate subject choices should be made at the end of TY and all TY students should have the opportunity to sample Biology either as a module or a subject.

The inspectors noted that some students chose to study Biology without completing the full programme of Science in junior cycle. While completing Science is not a mandatory requirement for Biology, knowledge of certain scientific concepts and of the scientific method is important. A TY biology module can provide a valuable method of bridging this gap but it does not, and should not, seek to cover all of the junior cycle concepts. Having students who have not studied Science in a Leaving Certificate biology class group presents particular challenges for the students and the teachers involved. Thus, schools should ensure that all students are given appropriate guidance and advice when considering studying Leaving Certificate Biology if they have not completed the full programme of Science at junior cycle.

In 85% of instances, inspectors found that there was very good access to Leaving Certificate Biology for all students in the school regardless of ability, including those with an assessed special educational need. Students with special educational needs can access the biology curriculum through differentiated approaches and methodologies including those that place a strong emphasis on using an active approach to learning and those that make use of concrete experiences that relate to the students’ environment and prior learning. However, in a few instances, the inspectors were concerned that access to Biology was limited for students with an assessed special educational need. The reasons for this were largely a direct consequence of these students not getting the opportunity to take Science in the junior cycle. It is
recommended that all students should have equal access to subjects regardless of their perceived ability levels, and that subject choices should be made by the students in consultation with their parents and based on advice and guidance provided by the school.

Although more girls than boys consistently select Biology, the inspectors judged that the subject was seen as a viable option for both sexes and in both types of single-sex schools. In a few instances, for example in very small schools where Biology was set against only one other subject in an option block, the inspectors noted that such arrangements could lead students to choose subjects on the basis of perceived suitability to gender, and accordingly inspectors encouraged schools to address this issue.

In 90% of instances, students were placed in class groups for Leaving Certificate Biology on a mixed-ability basis. This included schools with more than one group studying Biology. Only 4% of the schools streamed groups each year. For the remaining few schools, class groups were separated into ordinary level and higher level on a year-to-year basis. The inspectors favoured the practice of organising mixed-ability groupings and they found that biology teachers were generally experienced in dealing with a range of ability in their class groups. As outlined in section 4.4, the inspectors found that, in most instances, teachers encouraged their students to take the subject at the highest level for the longest possible time.

**Features of good practice**

- All schools that provided a TY programme included Biology in the programme
- In almost all schools, subject option blocks were tailored annually to best fit the preferences expressed by the students
- In 85% of instances, there was very good access to the subject in the Leaving Certificate for all students
- Class groups for Biology were of mixed ability in almost all schools

**Concerns**

- A few students were studying Biology without having studied Science for the Junior Certificate
- In a few instances, access to Biology was limited for students with an assessed special educational need
- In a few instances, students were asked to select their subjects before the Transition Year and to carry them through to the Leaving Certificate
2.2 Timetabling and the deployment of teachers

In almost all schools, inspectors found that the timetabled provision for Biology was in accordance with syllabus recommendations. The syllabus recommends the equivalent of five lessons per week, each of forty minutes duration, with the five lessons to include a double-lesson period. In a few schools, the lesson periods were shorter than forty minutes, but the overall time allocated over the course of two years was equivalent to the syllabus recommendations and this was found to be satisfactory. The inspectors found shortcomings in relation to the timetabling of Biology in a small number of schools. In two schools where lessons were just thirty-five minutes in duration, the shortfall was not adjusted. This resulted in an overall time allocation that was less than that recommended by the syllabus. Other shortcomings included the timetabling of double lessons over breaks or the absence of any double-lesson allocation. Such practices can have a negative impact on the implementation of a course of practical work for students. In one school, purposely only single lessons were arranged to provide for the specific needs of students appropriate to the context of that school. Good practice was seen where there was a balanced distribution of lessons throughout the week and this was achieved in almost all instances.

Good practice was noted where teachers were assigned to teach the various programmes and levels on a rotational basis and where they retained their class groups through the two years of the Leaving Certificate programme. The inspectors recorded as good practice that newly appointed biology teachers experienced a formal induction into the school and the subject department and that they were mentored by an established biology teacher during their first year.

Features of good practice

- In almost all schools, the timetabled provision for Biology was in accordance with the syllabus recommendations
- A satisfactory distribution of lessons throughout the week was achieved in almost all instances
- Teachers were assigned to programmes and levels on a rotational basis and they retained their class groups throughout the programme

Concerns

- There were issues in relation to timetabling in a small number of schools
2.3 Access to laboratories

Access to a laboratory for lessons in Biology ranged from good to very good in almost all schools as access was usually provided for the double-lesson period and for many of the single-lesson periods also. The inspectors noted flexibility among the teachers in facilitating laboratory access where they had planned certain practical work or tasks for particular days. In most schools, access to the laboratory for lessons in Biology was timetabled formally for the class groups. In a few schools, access to a laboratory for biology lessons was less than optimal and this was generally where there were difficulties in timetabling double-lessons in the laboratory or where there was very large demand for laboratory facilities. Optimal practice was observed where laboratories were used solely for teaching and learning in the science subjects.

Features of good practice

- Access to a laboratory for lessons was good or very good in almost all schools
- In most schools, access to the laboratory was timetabled formally

Concerns

- In a few schools, usually because of difficulties with timetabling or because of a very large demand for laboratory facilities, access to a laboratory for biology lessons was less than optimal

2.4 Provision, organisation and use of facilities and resources

The order and maintenance of laboratories were considered to be good or very good in 88% of the schools that were reported on and, encouragingly, inspectors found much good practice evident in this area. Laboratory provision and maintenance were usually very well supported by senior management. In their planning, most schools had given consideration to future needs for maintaining and stocking their laboratories.

Ample resources for practical work were in evidence in 85% of the schools with, what the inspectors judged to be, an adequate level of resources in the remaining 15% of schools. An annual budget was in place for subject departments for the funding of necessary resources and consumables in 40% of the schools. Funding was provided by management when requested by the teachers in the other 60% of schools. Systems for monitoring and replenishing stock were effective and most frequently this was facilitated by a co-ordinating teacher and, in some schools, managed co-operatively by teachers. Some schools undertook an annual audit of equipment and a register of the equipment was maintained electronically. There was a need for better organisation and access to resources for practical work in a few laboratories and where this was encountered the inspectors made appropriate recommendations.
It was usual to find that teachers had arranged resources in an accessible manner to facilitate their use by many teachers. Systems and procedures for maintaining such order and accessibility were usually agreed during subject-department meetings. In many schools, where the storage area had a high level of usage, the teachers had put together resource boxes for some practical activities. Typically inspectors reported on such commendable organisation as follows:

The laboratories and preparation/storage areas present as well-organised environments with clearly labelled presses allowing ease of access to resources during practical work.

The inspectors reported very favourably on the enhancement of laboratories with modern charts, models, plants, books and photographs. Such enhancement was also evident in the classrooms that were used as base rooms for Biology. Many schools displayed newspaper articles on areas of topical interest. Good practice was seen where the students’ work was displayed, helping to create an added visual and learning stimulus. Some schools displayed key words in Biology to support learning. In some schools, notice boards in the corridors were used to promote careers and activities in the sciences. In a few instances, the inspectors recommended that the displays be changed more frequently in line with the topics being studied in order to maintain interest and that more student-generated work be displayed.

**Features of good practice**

- The order and maintenance of laboratories were considered to be good or very good in 88% of schools
- A high level of organisation was found in most laboratories
- Ample resources for practical work were in evidence in 85% of the schools with an adequate level in the remaining 15%
- Most laboratories were enhanced by displays of teaching resources and student work that was changed frequently

**Concerns**

- There was a need for better organisation and access to resources for practical work in a few laboratories

### 2.5 ICT and audio-visual resources

Overall, the level of ICT and audio-visual resource provision to support teaching and learning in Biology was most favourable. In almost all the schools, a computer with broadband internet access and a data projector were available in a laboratory. The small number of schools without such resources had plans in place to acquire them. Good-quality boards, suitable screens and adequate blinds were the norm, supporting the use of such facilities. In a few schools,
inspectors noted the beneficial use of a digital camera to make a photographic record of the flora and fauna of the local habitat. All schools had ready access to audio-visual facilities to show videos or DVDs. Inspectors noted a very good range of video and DVD resources for the subject in most schools. In a few schools, teachers had developed an on-line virtual learning environment that the students could use to support their learning, and which enabled them to access lesson notes, assignments and feedback.

Most teachers maintained teaching and learning resources in electronic format including lesson presentations on a range of topics. In many schools, biology teachers set up shared electronic folders for their files. Good practice was noted where the school’s computers were networked, allowing access to files from any location and from the teachers’ work area. The inspectors recognised that, in a small number of instances, teachers needed to gain more experience in the use of ICT. In these instances, the inspectors recommended engagement with modular courses or networking with colleagues so that ICT can be further integrated into teaching practices.

Data-logging equipment was available in almost all schools. However, given that the equipment was funded for the physical and chemical sciences and that the probes are costly for biology departments, it is understandable that the specific probes for biology practical work have been acquired in only a few schools. Data-logging, as a method of data collection provides one possible approach to the design of investigations in Biology and ought to be considered more. Where the equipment is available in the school and where funding allows, biology teachers should, over time, budget for one unit of equipment for at least one of the biology experiments and plan for the development of teacher competencies in the use of the technology. The Biology Support Service (BSS), which was incorporated within the Professional Development Service for Teachers (PDST) in 2010, has provided in-service courses in the application of data-logging and this has been availed of by some teachers but the use of this technology in Biology remains very much limited.

**Features of good practice**

- The level of ICT and audio-visual resource provision was most favorable in almost all schools
- In some schools, computers were networked, allowing biology teachers to access files from any location
- A few schools had developed a virtual learning environment that the students could use to support their learning

**Concerns**

- The use of data-logging with practical work in Biology remains very limited
2.6 Teachers’ professional development

The inspectors’ reports frequently referred to the very good support from management for teachers to attend externally provided professional development events, in particular the in-service provided by the support services.

Teachers were seen by the inspectors to be progressive and committed to keeping up to date with syllabus developments and innovations. There were many instances of opportunities taken by teachers to engage in professional development events nationally and internationally. In approximately 25% of the schools, the school funded membership of the Irish Science Teachers’ Association for one or more teachers. The inspectors found that some teachers had forged strong links with the support services through their local education centres and were actively engaged with the service. They also noted that some individual biology teachers had gained relevant and desirable competencies through this engagement. The inspectors recommended sharing information from such courses with other teachers in the school. Such an approach to disseminating the knowledge gained as a result of professional development experiences would be most helpful to the small minority of biology teachers who had not yet attended any in-service in the revised syllabus. In commenting on this topic one report stated:

> Some biology teachers are actively involved with the BSS as part of a Teacher Design Team and with the national Discover Sensors project. There was evidence that such participation has provided a great source of useful ideas for teaching Biology, benefiting teaching colleagues and students.

The biology teachers spoke very positively about the high quality of support and resources offered by the support service personnel and the BSS web site. The work of the support services for Biology has particularly encouraged skills development and has provided high-quality resources for each unit of the syllabus. A large amount of very suitable resources, including presentations, animations, assessment material and a laboratory manual for biology teachers has been developed by teachers for teachers and these are disseminated through courses, events and the BSS web site. The web site also includes an on-line discussion forum for teachers to post queries and ideas, a resource exchange, resources for teaching Biology through Irish and a link to an on-line health and safety course. In recent years, a DVD is compiled annually of resources gathered nationally by a team of local facilitators and this has been very well received by teachers. The inspectors found that the teachers were able to fully engage with, and fully implement, the required curricular
changes as an outcome of the in-service education provided by the support services. They concluded that the support service for Biology has had a very significant and positive effect on the development of teaching and learning in the subject.

**Features of good practice**

- Consistently, school managements have encouraged and facilitated teachers to attend professional development courses
- Inspectors frequently found teachers to be progressive and committed to keeping up to date with syllabus developments and innovations
- A large amount of very suitable resources and materials has been developed to support the teaching and learning of Biology
- All teachers were able to fully engage with, and fully implement, the required curricular changes as an outcome of the in-service education provided by the support services

**Concerns**

- A small minority of biology teachers have not received any in-service in the revised syllabus or do not make use of the resources and web site provided by the support service for Biology

---

**2.7 Health and safety**

All schools had a health and safety statement. Best practice was noted where an up-to-date health and safety statement had been drawn up, in accordance with the *Safety, Health and Welfare at Work Act 2005* and the *Safety, Health and Welfare at Work (General Application) Regulations 2007*, identifying risks for the science laboratories and the steps to be taken to minimise those risks. However, in a few instances, inspectors found that the safety statements were not up to date or were not made known to all staff. In such instances, the inspectors recommended that these issues be addressed as a priority.

A high priority was given by teachers to the active management of safety issues during student practical work in all of the schools, as was evidenced by the use of appropriate personal protective equipment and the proper conduct of students during practical work. Laboratory safety rules were usually prominently displayed, although in a few instances, inspectors made recommendations regarding some improvements that were required. Most laboratories were well-appointed and met modern safety standards. Shortcomings were few and included signage, chemical storage and gas isolation and these were addressed by all of the inspectors in their recommendations. Where required, schools were referred to information on the storage of
chemicals available through the support service for the sciences as some improvements in the storage of chemicals were needed in 15% of the schools.

**Features of good practice**

- A high priority was always given to the active management of safety issues during student practical work
- Procedures were in place for the safe and proper storage of chemicals in 85% of instances

**Concerns**

- In a few instances, safety statements were not always up to date or made known to all staff
- The storage of chemicals was a potential safety issue in a few schools
Chapter 3

The quality of planning and preparation
3.1 Subject departments

The inspectors found that collaborative planning structures and practices were very well established in the schools. The planning process for science subjects was supported by the existence and structures of a formal subject department in the schools. In almost all instances, the science staff met regularly and the biology teachers were part of these meetings. School managements were found to be very supportive of formal planning. The science teachers usually worked as a team to develop the science plan for the school, focusing mainly on organisational and curricular matters. Almost all schools had a science department where one teacher acted as the co-ordinator. Increasingly, this role is being rotated among the science teachers, and this is to be encouraged. Good practice was also evident in the setting of an agenda for meetings and in the recording of minutes. Also, the instructional leadership role of co-ordinators is developing; they are sometimes involved in encouraging teachers to discuss teaching and learning approaches, conducting an analysis of examination outcomes, reviewing plans and disseminating information from courses. Very good practice was observed in a few instances when co-ordinators facilitated the setting of priorities for development annually and when teachers developed action plans around these; for example, setting a goal to raise the attainment of students in the subject.

In most schools, biology teachers communicated with each other frequently, mainly as a direct consequence of sharing resources. More formal partnership took place where teachers worked together to develop a subject plan or a TY biology programme. It was found that only in larger schools were the biology teachers facilitated to meet formally as a discrete group outside of science department meetings.

A very high level of collegiality and mutual support was evident among biology teachers. The level of collaboration among the biology teachers was described as good or very good in 80% of the schools. Inspectors noted favourably the instances where newly appointed teachers were mentored throughout the year by an experienced teacher. Similarly, positive comments were recorded where colleagues gave ongoing support to those who were teaching the TY biology programme or the LCA science elective for the first time. In a small number of instances, collaboration among the biology teachers was poor with teachers working independently. In order to increase team-working in these schools, the inspectors recommended that the biology teachers arrange a regular meeting time to discuss teaching approaches for topics or to work together to set up shared files of resources and assessment instruments.
Opportunities for collaboration and sharing of good practice are also available to biology teachers through the Teacher Design Teams and Action Research projects developed by the support service for Biology and details of these are available at http://biology.slss.ie or through links on the web site of the Professional Development Service for Teachers (PDST), www.pdst.ie.

3.2 Planning for resources

The range of available teaching and learning aids was considered good or very good in 84% of the schools. Inspectors found that the teachers had carried out good work in preparing and sourcing a diverse range of aids including text-based resources, media-rich presentations, video clips, web downloads and 3D simulations. In all instances, teachers had assembled personal files containing a variety of teaching aids, handouts, assessments and other support materials. Biology teachers are increasingly making effective use of ICT in sourcing, designing and storing resources. A small proportion of teachers are using paper files. The resources made available by the support services were evident and in use in almost all schools and the inspectors found that the potential offered by the support service’s web site and on-line forum was being realised. A wide range of suitable charts and models was available in most schools. Most reports praised the quality of resources used in lessons for enhancing the learning processes. In only a few instances was there a need to develop and diversify the range of topic-specific resources to better meet the range of abilities and learning styles in the class group. Where the inspectors encountered this they made suitable recommendations.
In 68% of the schools, the good practice of teachers sharing their teaching aids was noted. These resources were easily accessible as the teachers had developed a central storage space for them. Many schools had extensive teaching and learning resources on their computer network. However, a database or inventory of the full range of teaching and learning aids for topics and programmes was in place in only 6% of schools. As a priority, all schools should establish such a database. Doing so will assist in planning for teaching and learning, in budgeting and in ordering resources.

### Features of good practice

- The majority of biology teachers pool and share their teaching and learning aids
- A varied range of suitable teaching and learning resources is used in most schools
- Biology teachers are increasingly making effective use of ICT in sourcing, designing and storing teaching and learning resources

### Concerns

- There is a need to develop an inventory of the full range of teaching and learning aids for topics and programmes in almost all schools

### 3.3 The subject plan

Inspectors reported that an agreed subject plan for Biology, as a distinct document from the science plan, had been developed by the biology teachers in 87% of the schools, and this was very encouraging. A small minority of schools had a poor plan or no collaborative plan, with planning done individually by the teachers.

Best practice was seen when teachers exercised flexibility in the sequencing of topics each term and were able to innovate within the agreed scheme. The contents of the plan for Biology, however, varied considerably between schools: the most basic of plans only listed a series of curricular topics to be covered each year. The majority of biology subject plans, however, were of a satisfactory quality. In most instances, the plan included a set of agreed practices in areas, such as homework and assessment, including assessment for learning. In addition, plans were differentiated for TY, LC and LCA. In almost all instances, evidence of planning for health and safety was found. The inspectors considered that plans were of optimal quality when curriculum content was integrated with methodologies, varied assessment strategies, practical work, revision, and resources. In addition, the specification of a set of learning objectives for students in the plan was desirable.
Inspectors expressed concern at the frequency with which improvements were required in the planning documents in a notable number of schools. Frequently, the plans were not specific or consisted of brief notes in isolation on areas including: teaching and learning methods; approaches to special educational needs; homework and assessment practices; differentiation and mixed-ability teaching; resource listings; and procedures for record keeping and monitoring of student achievement. The inspectors addressed these issues in their reports and typical commentary included:

The inclusion of methodologies in the plan would ensure that teachers do not unwittingly restrict themselves to a preferred dominant style of teaching and ensure that material is always taught in a manner appropriate to the topic and to the students.

It is recommended that the good work in the plan be built on by including aims for the teaching of the subject, details of assessment and homework practices and a section setting out long-term goals and strategies for the development of the subject and facilities.

The improvements that are needed in these areas should be identified and carried out following each annual evaluation and review of the implementation of the plan.

Subject plans were viewed by the teachers as working documents and in almost all instances they were completed electronically, facilitating review and annual updating. However, it was not always apparent, when the inspectors examined the subject plans from different academic years, if the review process was used to modify teaching and learning practices. In such instances, the inspectors emphasised the importance of modifying the plan to meet the students’ needs. In addition, the inspectors recommended that an annual analysis of the school’s results in the certificate examinations be used during the review process as one source of evidence of the students’ learning.

The quality of planning and the components of the plans for TY Biology were good or very good in most schools. There were some very good examples of well-considered, diverse and innovative plans. Plans for TY Biology often included a variety of short modules, such as environmental studies, bioinformatics, horticulture, forensics, microbiology and cosmetics, that had been designed by the teachers themselves or either sourced or adapted from modules produced externally by national bodies. In some instances, cross-curricular modules were innovatively developed in collaboration with other departments in the school and these included sports science, data handling and food safety. Good practice was seen when module content was described in terms of desired learning outcomes that related to knowledge, skills and attitudes and students were assessed in
each of these key competencies. Where planning for TY Biology was unsatisfactory, it was usually as a consequence of the inclusion of material or the use of an approach that was not original, stimulating or significantly different from that used in the Leaving Certificate or where procedures for assessment, record keeping and reporting needed improvements. In these instances, the attention of teachers and senior management was drawn to circular M1/00 and the publication Transition Year Programmes-Guidelines for Schools. Good practice was noted where the TY biology module was designed collaboratively, with the teaching of the programme rotated amongst teachers, and where it was evaluated annually by students and teachers, the plan reviewed accordingly, and where the review process was overseen by the school’s TY co-ordinator.

Features of good practice

- In most schools, teachers had developed a subject plan for Biology that complemented the science plan
- The majority of subject plans for Biology were of a satisfactory quality
- In most instances, the plan for TY Biology was innovative and diverse with very good examples of cross-curricular modules devised in some schools

Concerns

- Written subject plans in some schools had limited or no reference to important issues such as teaching and learning methods; resources; differentiation; approaches to special education; modes of assessment; and monitoring of student achievement
- Most subject plans showed no integration of strategies with curriculum content
- In 28% of the schools, there was no evidence that evaluation and review of the subject plan were integral to planning
- Improvements were needed in the planning and operation of TY Biology in some schools
3.4 Teachers’ individual planning

Good practice was observed where teachers’ individual planning complemented the subject plan and the subject-planning processes. Evidence of thorough individual lesson planning by teachers was found in 83% of the schools evaluated. This lesson planning displayed an awareness and understanding of the needs, interests and abilities of the full cohort of students as well as the requirements of the syllabus or programme. Such planning showed that teaching and learning methodologies, classroom resources, homework, revision schedules and assessment instruments had been tailored to meet students’ individual needs. A few instances where lesson planning and preparation were poor included situations where teachers had not checked if the equipment was working prior to the lesson, where teachers had not fully prepared for every phase of the lesson and occasions where teachers did not take due cognisance of the range of student abilities, motivation or learning styles present in the group, including their proficiency in English.

In almost all instances, inspection reports emphasised appropriate prior preparation for successful student practical work. Teachers had very carefully prepared the full set of necessary materials and these were well organised, sufficient in quantity and to hand.

One report that commented on good practice in teacher preparation stated that:

Presentations and worksheets were carefully chosen to maximise opportunities for student involvement and to provide a visual reference for learning. Materials for student-centred practical work were ready in advance contributing to the smooth flow of the lesson.

Features of good practice

- In almost all instances, suitable preparation had been undertaken for individual lessons
- In almost all lessons, the teachers displayed, through their planning, an awareness and understanding of the needs, interests and abilities of the individual student

Concerns

- In 17% of the schools it was evident that individual lessons should have been better prepared
3.5 Planning for the inclusion of all students

Biology was taught mainly in mixed-ability classes and features of good practice in differentiation were found in almost all lessons, indicating effective prior planning. However, the majority of planning documents did not include descriptions of such practices or details of how teachers differentiated their lessons. In 71% of the schools, the inspectors found that there was scope for developing the written plans in relation to practices for the inclusion of all students. Some plans described liaison between the subject department and the learning-support teachers in the school. In a few instances, the inspectors noted that tips for teaching students with certain special educational needs were attached to the subject plan but individual education plans were not in evidence. A typical recommendation in reports stated:

It is recommended that planning for students with special educational needs would be developed using the expertise and advice of existing staff with experience in this area. This item should be placed on the agenda for science meetings from time to time to ensure on-going development.

To assist in the productive development of written planning in this area, the following reports should be considered:

- *Inclusion of Students with Special Educational Needs: Post-Primary Guidelines* (Department of Education and Skills);

*Guidelines for Teachers of Students with General Learning Disabilities* (National Council for Curriculum and Assessment);

*Guidelines for Teachers of Students with Mild General Learning Disabilities: Post primary* (National Council for Curriculum and Assessment); and *Intercultural Education in the Post-Primary School* (National Council for Curriculum and Assessment). In addition, schools should draw on the range of resources available through the Special Education Support Service at www.sess.ie.

### Features of good practice

- Liaison with the learning-support department took place in some schools
- In almost all instances there was evidence of effective prior planning and preparation for the range of learning needs in the differentiated setting

### Concerns

- The majority of planning documents did not describe provision for the inclusion of all students, particularly provision for students with special educational needs
Chapter 4

The quality of teaching and learning
### 4.1 Lesson structure

The inspectors found that almost all lessons were well structured and proceeded at a suitable pace. Most lessons incorporated some student activity and involved elements of stimulation and challenge for the students, to which they responded well. Weaknesses in a few schools, in relation to the structuring of lessons, included the need to break up long teacher-led sessions with opportunities for student-focused activities. In pacing lessons, teachers generally struck a good balance between reinforcing students’ prior learning and teaching new material. A review of the lesson topic concluded most lessons.

While the inspectors considered that all lessons had clear intentions for what the students were to learn, formal learning objectives were communicated to the students in less than half the lessons. It is recommended that the learning objectives be shared with students during the lesson so that they are focused on exactly what they should achieve. The inspectors frequently recommended that:

…clear learning objectives be outlined to students at the outset of lessons. These objectives should be concise and achievable. Learning objectives provide a basis upon which teachers can summarise the lesson content at relevant stages during the lesson, and again at the end of the lesson, and upon which homework can be given. Expressing learning objectives can encourage a degree of self-assessment by students within the class and help individuals to monitor their own progress.

Teachers often introduced the lesson by finding out what the students already knew about the topic. In all instances, the strategies that were used to build on the students’ prior knowledge were very effective and wide ranging. For example, good practice was observed in how questions were used to elicit information from students on their knowledge of a topic. Teachers expertly made use of opportunities to contextualise the material being covered and they made it relevant by referring to contemporary events, film and the media, or by drawing on students’ everyday life experiences. Consistently, strategies that supported continuity between lessons and helped students to visualise the connections in the whole course were utilised, facilitating a commendable, integrated approach to studying Biology.

The balance between phases of teacher activity and student activity was almost always very good. It was considered effective in 69% of lessons and optimal in a further 26% of instances. The Leaving Certificate biology syllabus affords a substantial number of opportunities for student practical work and for discussions on contemporary issues. These two key areas strongly favour lessons that include phases of
teacher activity and student activity. It was noted that the teachers were proficient at integrating such opportunities into the structure of their lessons.

### Features of good practice

- Lessons were predominately well structured and proceeded at a suitable pace
- Consistently, very good and wide-ranging strategies were used to build on students’ prior knowledge of topics
- Frequently, strategies that supported continuity between lessons and helped students to visualise the connections in the whole course, were expertly utilised
- The balance between teacher activity and student activity was appropriate in the majority of lessons

### Concerns

- There were a few instances of poor lesson structure with the need to incorporate opportunities for student activity
- Learning objectives for the lesson were communicated to students in fewer than half the lessons

### 4.2 Methodologies

Teaching of a good quality was observed in almost all lessons. The inspectors noted very high quality in the teaching they observed in 35% of instances and effective practice in a further 56% of instances. Almost all the inspectors’ reports commented favourably on the range of teaching methodologies including questioning, discussions, student practical activity, demonstrations, use of student worksheets, and teacher instruction as well as the use of the overhead projector, ICT or the board. TY lessons often incorporated a wider range of active methods including student research, investigation, self-directed learning, problem-solving activities and role play. One report on a school providing TY, LC and LCA lessons commented favourably on biology teaching as follows:

Skilful teaching strategies were applied to the teaching of Biology. These were characterised by the utilisation of differentiated methodologies, thorough lesson preparation and a commitment to continually challenge the students in cognitive recall and the application of their knowledge. A range of learning opportunities was provided, including much active learning. Student activity was varied frequently during lessons, thereby providing for differing learning styles and instruction was effective.
Where shortcomings in teaching methodologies were noted these included instances where there was a dominance of teacher instruction and where all students were not appropriately challenged at a level commensurate with their ability. In these lessons, there was often a need to bring greater variety to the learning experience for the students, especially given the predominantly mixed-ability nature of groups for Biology. In a few schools, the inspectors found inconsistency in the standards of teaching across the school. The inspectors recommended on such occasions that attention be given to sharing good practice, in relation to effective teaching methodologies, as part of collaborative subject planning and in some instances that mentoring be considered.

Inspectors noted that many teachers were adept in promoting whole-group discussion sessions at appropriate times, during which opinions and contributions were garnered and topics were allowed to develop. Students engaged enthusiastically in these discussions, often contributing astute observations and articulating diverse viewpoints, for which, in the best situations, teachers sought a scientific basis. Most frequently, discussions arose during lessons on physiological disorders, reproduction and genetics, and sometimes involved teachers encouraging students to reflect on the ethical issues involved. In these ways, the aim of the Leaving Certificate syllabus, to develop students’ ability to make informed evaluations about contemporary biological issues, was being realised.

In almost all Leaving Certificate lessons, textbooks were used to supplement and reinforce the learning and teaching which had already been completed during the lesson. Textbooks were also used as a visual reference and for the setting and preparation of homework. However, there were a few instances where teachers relied heavily on the textbook in their teaching and where the inspectors were concerned that a lack of variety had led to passivity and disengagement for most of the learners. In such circumstances the inspectors recommended the use of more active teaching and learning methodologies.

Visual or text-based presentations were often used to very good effect and were seamlessly integrated in lessons to illustrate a topic or to outline key stages in a particular procedure. The inspectors found that worksheets, in particular, were well designed, providing opportunities for students of varying abilities to practise their learning and for teachers to ascertain the different levels of student achievement.

The teaching resources that were used for the TY and LCA programmes, generally, were innovative in their design. In
addition, they were frequently very well differentiated in terms of challenge for the student. Poor use of TY and LCA resources was cited in only a few instances. For example, there were a few situations where handouts with notes and diagrams were over-utilised and students would have learned more effectively if they had been challenged to make out their own notes, with key words or prompts as assistance, construct mind maps, or summarise what they had just learned.

The use of ICT by teachers during lessons, either in making presentations or using the internet, was noted in 60% of schools. The reports commented that in nearly all of these schools ICT was used effectively. The most effective uses of ICT included instances when it was used in a lively and interactive manner to demonstrate a procedure or animation or to give students an opportunity to put their learning into practice. Students’ use of ICT was observed in only two of the schools; in one school, TY students were brought to the computer room to research their projects and, in another school, a mobile set of laptops was used by pairs of students to navigate the internet, to locate resources and to complete an on-line quiz. Data-logging equipment affords teachers the opportunity to integrate student use of ICT with practical work and consistent with comments in section 2.5 of this report, it is recommended that the use of this technology be considered.

The inspectors’ findings about the quality of teachers’ communication were positive and encouraging. Most reports commented favourably on the clear and concise instructions given to students. Almost all teachers displayed a very high level of knowledge in the subject area combined with an enthusiasm for the subject. Skilful practice was noted in almost all instances where teachers used language that was appropriate to the needs of their students while maintaining the precision required by the subject matter. In most instances, important biological terms were either written or displayed on the board for emphasis and there was much evidence of good practice in ensuring the pronunciation, understanding and reinforcement of these terms by students during lessons.

The quality of teacher questioning was reported as good in 66% of the schools evaluated and optimal in a further 25% of instances. While this indicates overall a good standard, the inspectors found inconsistencies within schools. Shortcomings in certain aspects of teacher questioning were noted in at least one instance in 52% of the schools. These included situations where questions did not encourage deeper thought, reflection, imagination, or problem-solving, where insufficient time was allowed to formulate a response, where chorus answering prevailed, and where a few students dominated the answering. Good practice was noted when a combination of lower-order and higher-order questions was
used and when there was a balance between global questions and questions that individual students were requested to answer. There were many very good examples of teachers affirming students in their contributions and continually encouraging them to justify their answers. The inspectors ascertained that questioning was usually well applied during the preparation and analysis phases of student practical work. Teachers queried students on their understanding of the outcomes of investigations and this was most effective when the teachers encouraged students to think at a deeper level about the significance or the application of a particular experimental result. One report reflecting good practice stated:

The questions that were asked were suitably challenging and appropriate to the ability level of the group…. Questions ranged from information-retrieval-type questions to higher-order questions that were linked to other areas of study and application.

Most reports praised the ways in which classroom activities were supplemented by good or very good opportunities for co-curricular and extracurricular activities and this is commended. These activities provided a means of stimulating interest, supporting the subject and putting Biology in a wider context. Approximately 50% of the schools placed significant emphasis on promoting engagement in such opportunities and the inspectors found that a wide range of suitable competitions and events was endorsed in schools.

While the inspectors found that biology lessons were mainly very effective, there was scope to embed further innovative approaches to knowledge building in biology lessons, such as reflective learning through mind mapping, the transfer of theory and skills to practice through problem-based learning approaches and student research within authentic contexts. While opportunities for these methodologies were sometimes realised in TY and LCA lessons, there was considerable scope for their application in Leaving Certificate Biology. In addition, the application of pair work or group work (other than during practical activities) was very limited in biology lessons and this is an area in need of development in biology teaching.
### Features of good practice

- A good quality of teaching was observed in almost all lessons
- Skilfully managed discussions about contemporary issues took place frequently in biology lessons
- A range of appropriate teaching and learning resources was used in almost all lessons and these resources were generally of a very high quality
- ICT was used by teachers in the majority of schools and best use was made of the technology when it was used in a motivational, interactive and student-centred way
- In almost all instances the teachers’ communication of the lesson content, enthusiasm for the subject and their command of the subject matter was good
- The quality of teacher questioning ranged from good to very good in almost all instances and questioning was particularly well applied during the preparation and analysis phases of student practical work
- The majority of schools placed emphasis on promoting engagement in appropriate co-curricular and extracurricular activities

### Concerns

- Teaching approaches that promoted active student learning were lacking in a few instances
- In a few instances, not all students were appropriately challenged by the lesson
- A predominantly instructive and teacher-centred approach was taken in a few lessons
- A few teachers overly relied on textbooks in their teaching
- Students often had insufficient opportunities to use ICT themselves in biology lessons
- Opportunities for students to use the school’s data-logging equipment could sometimes have been better exploited
- The use of pair work and group work is an area in need of development in biology teaching
- There is scope to embed further innovative approaches to knowledge building in Leaving Certificate biology lessons
4.3 Differentiation and provision for additional educational needs

Elements of differentiation and accommodation of different learning styles were noted in 94% of lessons. Mixed-ability classes require the use of differentiated strategies by the teacher to cater effectively for the spectrum of student ability that ranged from the exceptionally able to the less able. Such differentiation is characteristic of the skills of effective biology teachers. Effective differentiated teaching practices noted in schools included examples of skilful questioning, well-designed worksheets and teaching aids, productive engagement with individual students, setting gifted students additional challenging tasks and the setting of high expectations for each student. The inspectors noted a particularly high level of differentiation in lessons during the final term of the school year leading up to the terminal examination in Leaving Certificate Biology, both in revision practices and the development of the quality of students’ written answers to past examination questions. Two reports described good practice in differentiation as follows:

As groups are of mixed ability, teachers kept the whole class moving at a common level for as long as possible, usually differentiating into higher and ordinary level for tasks.... Gifted students were set additional challenging tasks. Teachers circulated while students were working independently to ensure the needs of students of different abilities including those with special educational needs were attended to.

In mixed-ability LC classes, teachers usually set work for either the ordinary-level or higher-level students while instructing or conducting assessments in the other level of the syllabus. In almost all instances, the work that was set involved individuals completing written work. While this allowed them to work at their own pace, the inspectors noted that much greater innovation could be introduced at such times, for example, by encouraging pair work or peer review which could be done quietly given the right classroom management procedures.

A few reports outlined the very conscious efforts made by teachers to support students with additional educational needs, including special educational needs and those for whom English is an additional language. Work in these instances included the use of good visual resources, sounding out words, simplified texts, specially designed handouts, booklets, worksheets and key word posters. There was also good use of repetition, recapitulation and review in the structuring of student work. Good formative assessment
strategies were employed including asking students for clarification and discussing with students individually how to improve their written work. Good practice was also noted in lessons where students who were experiencing a greater level of challenge in the subject conducted activities in a series of short achievable units, with opportunities for feedback and affirmation in between. One report noted:

Extra supports for students with special educational needs are provided through the promotion of a visual approach to teaching and learning. ICT and graphic organisers were used competently to generate visual imagery to enhance learning.

In a few schools, inspectors found that teachers did not accommodate the full range of student abilities, motivation or learning styles present in the group, including those with weak proficiency in English. In these inspections, inspectors made recommendations that teachers should participate in relevant professional development courses, liaise with the school’s learning-support department and consult external services for advice on helping students to engage with the curriculum and supporting them with the vocabulary for the subject. These included support from the web sites and services of the National Council for Curriculum and Assessment (NCCA) for teaching students with English as an additional language, the Special Education Support Service (SESS) and the Professional Development Service for Teachers (PDST), formerly the Second-Level Support Service (SLSS).

### Features of good practice
- Reports contained descriptions of the effective application of differentiation techniques in almost all instances and a few reports outlined the application of good teaching strategies and well-designed resources to support students with special educational needs.

### Concerns
- In a few instances, the lesson did not accommodate the full range of student abilities, motivation or learning styles present in the group.

#### 4.4 Practical work
Student practical work was a regular feature of biology lessons and this was most encouraging. Practical work in Biology was consistently well implemented and students engaged very well with the tasks. In most instances, students worked in small groups of two or three students to complete practical assignments. In no instance was mandatory student practical work replaced by a teacher demonstration. Good practice was observed in almost all instances where practical work was performed in conjunction with the theory being studied and this confirmed biological concepts in a tangible manner. In most instances, students were prepared for their
practical work by the very good use of a plenary session to review the theory and practice of the activity before the bench work started. Similarly, a plenary session was used when the practical activities were completed to review the work done and reinforce learning.

Very good attention was paid to safety issues and students approached the tasks with maturity. The students were able to complete the tasks in all instances and they benefited from the help and guidance provided by their teachers. It was the norm that the teacher circulated among the students while they worked and provided effective support and advice. The scientific approach was applied to all experimental work and there was significant evidence of the students mastering the skills of manipulating apparatus. In addition, students demonstrated very good communication skills, when working collaboratively. Consistently, students displayed good routines for setting up and clearing away apparatus and this contributed to the effectiveness of the lessons. In most lessons, suitable homework tasks, including writing the laboratory report, were set to reinforce the learning.

All students demonstrated very good ability in recording the data gathered during practical work. However, in most instances, the students’ competence in interpreting that data varied widely. Also, the students’ proficiency in drawing and interpreting graphs varied significantly. The inspectors noted the interpretation of data and the justification of conclusions as two areas where students required the most input and support from their teachers. In a small number of instances, these areas were not completed in students’ laboratory reports. It is recommended that teachers focus on improving students’ skills in graphing, analysing, and interpreting data. The planning for this work should be included in the subject plan.

Very good practice was noted in a few instances in Leaving Certificate Biology when an inquiry-based or open-ended approach was taken to the practical tasks. In these instances, teachers skilfully guided students to design and conduct the experiment and to interpret their results for themselves. While this approach is not currently mandatory in the Leaving Certificate Biology syllabus, the inspectors encouraged its use as it provides continuity for students from the skills learned in junior cycle Science and it supports the development of higher-order thinking skills.

Through examining the students’ ecology reports and by questioning students on ecology fieldwork, the inspectors noted that, in all instances, the students had visited an ecosystem and conducted appropriate and practical ecology fieldwork. The most frequently studied ecosystems included
the hedgerow, woodland, seashore and bog land. However, the inspectors found that, in under half of schools visited, development of the students’ skills in practical ecology fieldwork was not conducted by the biology teacher but was instead conducted during day trips to external centres that provide courses in ecology for TY, fifth-year and sixth-year students. The number of schools engaging in this was a cause of some concern. The primary concern of inspectors was that the students’ biology teacher was not directly engaged in the provision of the learning activity and instruction was provided by centre staff who may not have teaching qualifications and who would not be as aware of the learning needs or potential of individual students as their teachers. The students’ own qualified biology teacher is the best-placed professional to provide instruction in practical ecology fieldwork. In addition, suitable school grounds or habitats in close proximity to schools should be prioritised when choosing ecosystems to study.

**Features of good practice**

- Effective, meaningful, well-organised and rewarding student practical work in Biology was taking place in a large majority of schools
- Students demonstrated well-developed practical skills, were competent in the use of laboratory apparatus, and demonstrated good group-work and communication skills
- Very good attention was paid to safety issues and students characteristically demonstrated maturity in this regard
- Good practice was observed in almost all instances where practical work was used to introduce or to reinforce the theory being studied
- In a few instances, a commendable, open-ended approach was taken to practical work

**Concerns**

- In most instances, there was scope for improving students’ skills in graphing, analysing, and interpreting data collected during practical work
- In just over half the schools, skills development in practical ecology fieldwork was not provided for students by their biology teacher but was provided by staff in external centres
4.5 Learning

The quality of students’ learning was described as good or very good in 93% of schools. The students demonstrated a good level of knowledge, understanding and skills and they showed a positive attitude towards Biology in their interactions with the inspectors. The range and quality of their answers to questions posed by the inspectors were reflective of the mixed-ability nature of class groups. In almost all instances the inspectors were satisfied with the overall standard of learning.

In 87% of the inspections, there was evidence in the students’ copybooks and folders of written work that ranged in quality from good to very good, mostly with neat presentation. In many schools, students had accumulated a significant quantity of notes. Best practice was observed where notes were generated by the students themselves. With a view to reinforcing the retention of key terms and supporting students’ ability to discern information and direct their own learning, it is recommended that teachers place greater emphasis on the students learning to make notes on their own initiative.

There was evidence of the use of established routines in most lessons and students were aware of the teachers’ expectations of them. In 91% of instances, teachers had appropriately high expectations of all students, from the exceptionally able to the less able. High expectations were usually combined with the effective promotion of students’ confidence in their own learning. These actions supported a high level of engagement by the students. For the most part, students demonstrated a willingness to work diligently and they showed a high level of motivation in learning the subject.

Stimulation and challenge for the student were at an appropriate level in 90% of lessons and this was achieved by using a variety of activities in combination with appropriate visual imagery. Examples of poor practice in stimulating or challenging students included lessons where students were asked to record abstract concepts prior to any explanation of the material, where there was a lack of variety in teaching methodologies for long periods and where lesson content did not match the abilities of all students in the group. Very good practice was cited in a few reports where students were encouraged to assess their own learning through peer questioning, peer correction and brainstorming exercises that included the use of concept mapping. The inspectors found that in some instances there was scope to develop the use by students of self-directed learning techniques. This would help students to build knowledge rather than simply receive instruction passively. Ultimately, this helps students to gain a deeper understanding of the topic they are studying.
Features of good practice

- Most students were competent and confident in demonstrating and applying their knowledge and skills
- For the most part, teachers had appropriately high expectations of students and they fostered the students’ confidence in their learning
- An appropriate level of stimulation and challenge for the students was evident in most lessons

Concerns

- In a few lessons, there was a lack of variety of learning experience for the students
- In some instances there was scope for the development of students’ self-directed learning skills including an emphasis on student note-making as opposed to note-taking

4.6 Classroom management and atmosphere

The classroom atmosphere during biology lessons was respectful and affirming with a professional level of consideration for both the welfare and the attainment of students. In almost all lessons, the inspectors found that there were good quality interactions among the students and between the students and their teachers. When teachers were enthusiastic and lively in their manner of delivery of lessons, students were engaged and learning of a high quality occurred. Good practice was noted when students were encouraged and supported to take a shared responsibility for their own learning and this occurred principally through practical work and opportunities for assessment.

In most instances, appropriately high expectations were set for students in terms of behaviour, respect, co-operation, and manner of participation in lessons. For the greater part, teachers were supportive of students while also challenging them to develop their learning. The majority of students were well-behaved, attentive and eager to participate. The teachers sought and encouraged the students’ opinions in most lessons and the students were secure in making contributions. While teachers were accepting of students’ contributions, and allowed their input to influence the course
of the lesson at times, they demonstrated an obvious firmness in terms of classroom management. Instances of uncooperative behaviour were observed in a few lessons and these were dealt with effectively, for the most part. Where certain students were consistently disruptive, the inspectors recommended strategies for dealing with this and this often included taking a whole-school approach to the issue of student behaviour.

**Features of good practice**

- An atmosphere conducive to learning was found in almost all lessons
- Collaboration among students and their teachers was very good
- Students were given many opportunities for contributing constructively in lessons and they responded well to these opportunities

**Concerns**

- In a few instances, some students were disruptive or disengaged during lessons
Chapter 5

The quality of assessment
5.1 Modes of assessment

Inspection reports referred to the most frequently used modes of assessment in biology lessons as teacher questioning, homework correction, class tests, formal school tests including mock examinations, quizzes and ongoing monitoring of students’ individual progress while teachers circulated during independent student work. The inspectors found that formative assessment of students’ progress and learning by teachers was carried out during all phases of lessons. Almost all reports cited the frequent use of class tests throughout fifth year and sixth year and usually these were administered at the end of a topic or on a monthly basis. Mostly, teachers designed class tests that were based on the format and style of certificate examinations and included questions on practical work. Good practice was seen where students kept their set of tests in folders and referred to these during revision. In some schools, short quizzes and crosswords were also used to vary the modes of assessment.

One report that reflected many commented:

Students expect and receive a test at the end of every topic or set of topics and this is commended as they have frequent opportunities to perform in examination conditions and to get feedback on their individual progress.

Consistent with the findings in section 4.2 of this report, the inspectors found that verbal formative assessment/teacher questioning was good in most instances, though with some inconsistencies found within schools, and they pointed out that this could be improved by developing teachers’ questioning strategies.

More varied modes of assessment were found in TY, as is appropriate for the programme. Sometimes these modes included an assessment of teamwork skills and students’ willingness to participate in lessons. TY students were also commonly assessed on project work completed during the year. The inspectors reported good practice that involved detailed criteria for the evaluation of projects being clearly laid out for the students. In addition, formal school tests were usually administered at the end of each term or module. The development and adoption of these practices in Leaving Certificate Biology would prove beneficial in supporting assessment of the full range of skills developed by students during their studies.

Continuous assessment practices were found in just 23% of the schools evaluated. In instances where a system of continuous assessment was applied, it helped to maintain the students’ focus throughout the school year and it rewarded their ongoing work. Given the small number of schools in which continuous assessment was noted, it is recommended that teachers focus on developing their practices in this area.
The setting of common assessments across two or more class groups in the same school was cited in only 46% of the reports analysed. Where the biology teachers worked together to develop class tests, to administer common assessments at key times and to compare the outcome of common tests among the various class groups, this was considered by the inspectors to be good practice. In schools where this was not a feature of planning, the inspectors emphasised the potential of this good practice, given the mixed-ability nature of most groups, and made recommendations such as the following:

It is recommended that teachers co-ordinate their individual planning schedules to a greater extent to facilitate the introduction of common assessments where possible.

**Features of good practice**

- A wide range of ongoing assessment approaches was in use in almost all schools, with class tests administered frequently
- Most examinations were based on the format of the certificate examination and included questions on practical work
- Common assessments were set for class groups in 46% of schools
- Good practice was noted in the assessment modes used in TY in almost all instances, and assessment was varied and appropriate to the programme

**Concerns**

- Elements of continuous assessment practices were found in just 23% of the schools
- The potential provided by collaboratively planning and implementing common assessments was not fully realised in many schools
5.2 Students’ homework and written work

In most schools, a balanced combination of written homework and study was allocated to support students’ understanding of lesson topics. Homework was sometimes differentiated for higher-level and ordinary-level students and this was appropriate in each instance. The inspectors reviewed students’ copybooks and examined previous homework that had been allocated. Typical positive comments in reports included:

The homework given was appropriate to the lesson content, was varied as to type and was designed to assist the student in learning and understanding the topic.

The inspection reports revealed, however, that practice varied in 25% of the schools with regard to homework allocation and that agreed homework procedures were included in only 30% of the subject plans examined. For example, one report commenting on inconsistent practice in homework allocation across a school stated:

It was found that the type of homework allocated and the frequency of allocation varied from teacher to teacher. The school has a homework policy in operation but this is due for review and it may be timely for this area to be discussed by the whole staff.

In 74% of the schools, the inspectors commented positively on the quality of written feedback that teachers provided on students’ written work. Good practice was noted where students’ copybooks contained comments written by the teacher affirming good work and advising students on how their work may be improved. Inspectors also commented favourably on situations where a transparent marking scheme was fairly applied to tests or questions from past examination papers. However, recommendations on improving the quality of teachers’ written feedback were made in 26% of the reports. In a few instances, the inspectors drew attention to inconsistencies in practice between teachers in the monitoring of students’ written work, especially in the correction of homework. Inspectors found that, in schools where recent whole-staff in-service in assessment for learning had taken place, a range of strategies for formative assessment was in use and these were usually written into the subject plan. However, in some instances, limited or no obvious practices involving assessment for learning were in use and the inspectors often made recommendations to the school as follows:

It is recommended that the approach of assessment for learning (AfL) be examined and adopted as a means of enhancing teachers’ capacity in monitoring students’ performance and responding to their needs. Further information on AfL can be found on the web site of the National Council for Curriculum and Assessment at www.ncca.ie.
The inspectors found that students’ homework was regularly collected and corrected by teachers in 73% of instances, with inadequate practice in 27% of instances. The main means of correcting homework was through discussion during a plenary session at the start of the lesson. While this approach ensured immediate feedback to students and provided the opportunity for reinforcement and further clarification, in some instances only verbal feedback was given and this was mostly on a whole-class basis. This method of homework correction should not dominate and copybooks should be collected and corrected regularly for all class groups. The inspectors noticed that while the majority of students were diligent in making corrections in their copies during the plenary sessions, some students were not. In such instances the inspectors recommended that closer monitoring of the students’ work should be undertaken by the teacher.

Agreed assessment procedures, as a component of the subject plan, were in place in only 36% of schools. Establishing and recording agreed practices in relation to assessment is recommended for all schools. In this regard, it is recommended that each subject department collaboratively develop an assessment policy that outlines clearly its practices in relation to the modes of assessment to be used (including homework), type and frequency of correction of students’ written work, types of feedback to students, and procedures for recording and reporting on the outcomes of assessments.

### Features of good practice
- In most schools, a good combination of written homework and study was allocated to support students’ understanding of the lesson topic
- In the majority of instances, the level of monitoring of students’ written work and the quality of written feedback given to students was effective
- Conscious effort by teachers to employ a range of assessment for learning strategies was noted in some schools

### Concerns
- Recommendations on improving the quality of written formative feedback for students were made in 26% of reports
- Variable standards and inconsistencies among teachers in the type and frequency of homework allocated and in the effectiveness of written formative assessment were evident in a few schools
- Students’ work should be collected and corrected more frequently than was the practice in a number of schools
- Agreed homework procedures were set out in fewer than half of subject plans
5.3 Assessment of students’ skills and practical work

The quality of students’ laboratory reports was, in almost all instances, good or very good, but there were a few examples of a lesser quality. Best practice was seen when the quality of the students’ written laboratory reports showed progressive improvement over time. One report that highlighted good practice in this area commented:

The quality of the laboratory notebooks examined was very good due to the attention paid by the teachers to them, particularly in relation to recording results and drawing appropriate conclusions. The use of positive and affirming comments when correcting the laboratory notebooks is commendable.

One report outlining poor practice stated:

There was evidence that in some class groups the students usually copied the method from the handout or the book. This should be avoided in future and development of report-writing skills should be facilitated in all instances.

The inspectors found good practice in the monitoring of laboratory notebooks by the teacher in 59% of instances but made recommendations in the remaining 41% of schools. It is recommended that all teachers check and annotate laboratory notebooks on a regular basis and in so doing give comment-based feedback to students on how they can improve their work. It is also important that teachers follow up on the instructions given to students on how to improve their laboratory reports and check that these are implemented. As different approaches to the recording of practical work were observed between class groups in some schools, it is further recommended that agreed practices regarding the monitoring of practical notebooks be written into all subject plans. This could be accomplished during the development of an assessment policy for the subject.

In some schools, credit was given to students for practical work as part of the overall grade for the year or as part of a continuous assessment grade. In these instances, the teachers awarded an average of 10% of the examination marks to students for their practical notebooks. Rewarding students for the skills demonstrated in practical work and report writing is good practice and should be used in all schools.
Features of good practice

- The quality of students’ written laboratory reports was good or very good in almost all instances
- Students’ laboratory notebooks were very well monitored by the teacher in the majority of instances
- Some schools awarded marks to students for practical work as a component of the end-of-year grade

Concerns

- There were a few examples of poor report writing and incomplete work in students’ laboratory reports

5.4 Monitoring of student achievement

In almost all instances, there was evidence of good record keeping by teachers, sufficient to build a profile of each student, covering such areas as attendance, assessment results and work completed. Most teachers maintained paper-based records but increasingly teachers are using electronic files. In some schools, records of attendance and attainment were made available to senior management and year heads. Some teachers kept more detailed notes including a record of comments made in school reports, and records related to punctuality, behaviour, the quality of work done by the student and profiles of students’ abilities. Teachers’ records provided an appropriate means of monitoring students’ achievements and a reliable source of information for communicating students’ progress to parents and, in the case of certificate examinations, advising students and their parents or guardians on the appropriate level at which Biology should be taken. In a small number of instances, however, the monitoring of student achievement was confined to recording the results of assessments and attendance only. In such instances, the inspectors recommended improving the quality and extent of the records that were kept.

Consistently, inspectors’ reports cited very good arrangements for reporting to parents on students’ progress. Annual parent-teacher meetings were held for all groups with some schools scheduling two parent-teacher meetings in sixth year. Usually, formal reports were sent to parents twice each year; following school examinations at Christmas and summer in fifth year and after Halloween or Christmas examinations and mock examinations in sixth year, with a few schools sending reports home three times per year. In a small number of schools, monthly progress reports were prepared for parents and students in fifth year and sixth year.
Almost all schools conducted an annual analysis of the school’s results in the certificate examinations. Good practice was reported where this analysis was carefully examined by the principal in conjunction with the subject department. The inspectors found, in their discussions with teachers, that the outcomes of class tests and the school’s results in certificate examinations informed planning at a number of levels. However, verification of how this contributed to planning was not evident in subject plans. One report where very good practice was noted stated:

Test results are used to assess the progress of students and also to plan ahead. They are used to inform both teachers and students of the steps to be taken to improve performance and to set targets for future assessments.

It was noted that a small number of students in some schools are reluctant to take the ordinary-level paper despite the recommendations of their teachers. The decision as to what level to choose ultimately rests with the student and his or her parents or guardians. In some schools, there was scope for the introduction of a system to monitor students’ assessment outcomes in the subject. This could be extended to develop regular target setting where students would, in consultation with their teachers, identify clear, attainable targets to be achieved by specific dates. Schools and teachers should continue to ensure that all students are given appropriate guidance and advice on the issues surrounding their choice of levels for the certificate examinations.

### Features of good practice
- In almost all instances, there was evidence of good record keeping by teachers
- Consistently, reports cited very good arrangements for reporting to parents on students’ progress
- Almost all schools conducted an annual analysis of results in the certificate examinations

### Concerns
- A few students, in a small number of schools, may be choosing to sit the Leaving Certificate biology examination at a level that does not accord with their past achievement and performance in the subject
Chapter 6

Summary of main findings and recommendations
The quality of subject provision and whole-school support

Main findings
In the majority of schools, Biology has a high status within the Leaving Certificate and the TY programme.

The level of access to and uptake of the subject is very good for students of all abilities in most schools.

In 90% of instances, Biology is taught in mixed-ability class groups.

Almost all schools provided an appropriate time allocation of five forty-minute lessons per week or equivalent and this included one double period.

In almost all instances, class groups had good access to a laboratory for lessons.

There were ample and well-organised resources for practical work in most schools.

In many schools, the learning environment was enhanced by displays of scientific posters and students’ projects.

Modern facilities for the use of ICT and audio-visual resources by teachers were very good in almost all schools.

In almost all instances, teachers availed of opportunities for professional development and they were committed to keeping up to date with syllabus developments and innovation.

The Biology Support Service and more recently the Professional Development Service for Teachers has had a very significant effect on the development of teaching and learning in Biology and teachers were able to fully implement the required curricular changes in the revised biology syllabus.

A high level of attention to safety was evident in all schools.

Recommendations
Schools and teachers should ensure that all students are given appropriate guidance and advice on the issues relating to choosing Biology for Leaving Certificate if they have not completed the full programme of junior cycle Science.

Schools should not require students to select their certificate examination subjects before TY and to then carry them through to the Leaving Certificate.
Where lesson periods are shorter than forty minutes duration, schools should ensure that the overall time allocated to the subject meets the syllabus requirements.

Schools should include, on the formal school timetable, laboratory access for each biology class group for at least one double lesson per week.

All teachers should exploit the benefits to be gained from using ICT in their lesson preparation and during teaching.

Data logging, as a method of data collection provides one possible approach to the design of investigations in Biology and should be given greater consideration.

In a few schools, improvements should be made in relation to establishing up-to-date safety statements, proper storage of chemicals and safety signage.

**The quality of planning and preparation**

**Main findings**

A high level of consultation and collaboration among biology teachers was evident in most schools.

In most schools, biology teachers developed, evaluated and continually reviewed an agreed subject plan for Leaving Certificate Biology and the majority of these plans were of good quality.

In most instances, teachers developed innovative TY biology programmes of a high quality which supported the principles of TY, with very good practices noted in some schools where cross-curricular modules were developed.

In the majority of schools, the biology teachers shared teaching aids and made arrangements for shared access to available resources.

A wide range of stimulating and suitable teaching resources was available for all topics and programmes in most schools.

In almost all instances, lessons were well planned to ensure continuity and progress and they corresponded to programme requirements and the particular needs of students.
Recommendations
Subject plans for Biology should include the integration of methodologies with curriculum content.

Subject plans and lesson planning should make proper provision for the full range of abilities, needs and interests of all students as well as the requirements of the syllabus or programme.

All schools should develop an inventory of the full range of teaching and learning aids for topics and programmes.

The use of shared electronic files for storing teaching resources is recommended for all schools.

Schools should develop the instructional leadership role of subject co-ordinators.

The quality of teaching and learning

Main findings
Knowledgeable and enthusiastic communication of lesson content was found in almost all instances and this engaged the students and led to good learning.

Biology teachers were adept at contextualising topics to everyday situations, integrating topics from the whole syllabus and encouraging discussions on contemporary biological issues.

In almost all lessons, the quality of teaching was good or very good.

Differentiation, where it occurred, was effective in almost all instances.

The balance between teacher activity and student activity was appropriate in the majority of lessons, with teachers providing practical ways for students to develop their knowledge, skills and procedural understanding.

Most biology teachers had embraced the use of ICT and it was used well in lesson preparation and delivery.
Co-operation, shared responsibility and respect were promoted in almost all lessons.

In almost all instances, teachers had appropriately high expectations of all students and encouraged certificate examination students to study at the highest level possible for as long as possible.

In almost all lessons that were observed, the quality of learning was good with learning of a very high quality in lessons where a high level of stimulation and challenge were provided, where students were active and where students were fully engaged by the lesson.

In most instances, there was evidence in the students’ copybooks and folders of work that ranged in quality from good to very good.

The set of knowledge, understanding and skills required by the Leaving Certificate biology syllabus was achieved in most instances.

Mandatory student laboratory work was implemented in an effective, well-organised and safe manner and biology students demonstrated very good science process skills, group-work skills and communication skills in these activities.

**Recommendations**

Teachers should share and evaluate the learning intentions with students in all lessons.

All lessons should incorporate opportunities for student activity and students should not be allowed to remain passive for long periods.

Teachers should place greater emphasis on the students learning to make notes on their own initiative.

Opportunities for pair work and group work should be promoted in areas outside of practical work.

Further opportunities for students to use ICT equipment and data-logging equipment should be provided in biology lessons.

An inquiry-based, open-ended approach should be taken to student practical work whenever possible, to build on the skills learned in the junior cycle.

Developing students’ skills in interpreting and analysing biological data and their skills in drawing graphs are areas for improvement in most schools.
The students’ own qualified biology teacher is the best placed professional to provide instruction in practical ecology fieldwork and suitable school grounds or habitats in close proximity to schools should be prioritised when choosing ecosystems to study.

Teachers should create further opportunities for the development of students’ self-directed learning techniques as a progressive process during biology lessons.

There is scope to embed further innovative approaches to knowledge building in biology lessons, such as reflective learning through mind mapping, the transfer of theory and skills to practice through problem-based learning approaches and student research within authentic contexts.

**The quality of assessment**

**Main findings**

An effective range of assessment approaches was used in almost all schools.

A greater variety of modes of assessment was found in TY.

In the majority of instances, the level of monitoring of students’ written work and the quality of written feedback given to students was satisfactory with some exemplary instances of developmental feedback evident.

The quality of students’ laboratory reports was mainly good, and these were very well monitored by the teacher in the majority of instances.

Some schools award marks for practical work as a component of the end-of-year grade.

In almost all instances, there was evidence of good record keeping of student attainment and attendance with very good profiling of students by some teachers.

Very good arrangements were in place for reporting to parents on students’ progress.
Almost all schools conducted an annual analysis of results in the certificate examinations and in the majority of instances this informed planning for teaching and learning.

**Recommendations**

All schools should examine and adopt the pedagogy of assessment for learning in daily teaching practice and lesson preparation.

Common assessments should be set at key times, where appropriate.

Within the subject plan, teachers should develop agreed policies on assessment and homework. This will help to address any inconsistencies among teachers in the same school in how frequently such work is allocated to students and corrected by teachers.

Some improvements are needed in some schools to ensure that homework is allocated and corrected regularly.

All teachers should check students’ laboratory notebooks on a regular basis and give comment-based feedback on how the individual student can progressively improve his or her work.

Rewarding students for the skills demonstrated in practical work and report writing is considered good practice and should be used by all schools.

Schools and teachers should ensure that all students are given appropriate guidance on the issues surrounding their choice of level for the certificate examinations.

Target setting could be used more extensively to help students identify clear, specific and attainable learning goals.
References


Useful web sites

General education web sites
www.education.ie
www.ncca.ie
www.ncte.ie
www.examinations.ie
www.pdst.ie
www.scoilnet.ie
www.sess.ie

Web sites for teaching and learning in Biology
http://biology.slss.ie
http://lca.slss.ie/resource_category/view/924
www.science.ie
www.biotechnologyireland.com
www.embo.org
www.hsa.ie
www.juniorscience.ie
http://ty.slss.ie
www.ista.ie
www.npws.ie
www.enfo.ie
www.epa.ie
www.ase.org.uk
www.nsta.org

Department of Education and Skills
National Council for Curriculum and Assessment
National Centre for Technology in Education
State Examinations Commission
Professional Development Service for Teachers
Scoilnet (NCTE schools web site)
Special Education Support Service

Biology Support Service
Discover Science and Engineering
Biotechnology Ireland web site
European Molecular Biology Organisation
Health and Safety Authority
Junior Science Support Service
Resources for use in Transition Year
Irish Science Teachers’ Association
National Parks and Wildlife Service
ENFO public information on the environment
Environmental Protection Agency
The Association for Science Education (UK)
National Science Teachers’ Association (USA)
www.biotechinfo.ie
www.abpi.org.uk
www.eibe.info
www.schoolscience.co.uk
www.tryscience.org
www.puzzlemaker.com

Forfás web site
Association of the British Pharmaceutical Industry
European Initiative for Biotechnology Education
A school science web site supported by the ASE
Interactive web site for teachers and students (UK)
Discovery education site
Looking at Biology

*Looking at Biology* reports on the outcome of fifty-seven inspections of Biology conducted in post-primary schools between 2006 and 2010 by the Inspectorate of the Department of Education and Skills. The inspections took place in a range of post-primary schools and within all senior cycle programmes. The report presents observations of practice in the areas of subject provision and whole-school support, planning and preparation, teaching and learning, and assessment.

The key findings and recommendations in *Looking at Biology* reflect the quality of current practice in the teaching of Biology at post-primary level. The report contains useful advice for teachers, subject departments and school management especially as they engage in planning, self-review and improvement. It will also be useful in encouraging professional dialogue concerning the teaching of Biology and in informing school support services on aspects of the subject that need further support.

Teaching and Learning in Post-primary Schools

The series *Teaching and Learning in Post-primary Schools* includes short reports on the quality of educational provision in second-level schools. The reports are based on the findings of evaluations carried out by the Inspectorate, which has statutory responsibilities for the evaluation of schools at primary level and second level. The reports in the series deal with practice in schools and are intended particularly to assist schools and teachers as they engage in self-evaluation and review of their work.

*Evaluation Support and Research Unit*
*Inspectorate*
*Department of Education and Skills*
*Marlborough Street*
*Dublin 1*
*Ireland*