Introduction

In a review of science courses for stage 6 of the NSW school curriculum the Board of Studies developed draft syllabus packages for five science courses in January and February 1999. After distribution to the education community, the Board conducted extensive consultation on these syllabuses. This report describes the comments and concerns of the community for the Biology Draft Syllabus.

Summary of the Consultation Process.

The consultation consisted of three parts:
A. KEY GROUP meetings, a sequence of 8 meetings held 20-21 April 1999 in Sydney
B. FOCUS GROUP meetings, held at seven centres across NSW from 19-23 April 1999
C. SURVEY sent to teachers, professional associations, academics and parents for reply from 15 March to 30 April 1999.

The first section of the report provides a plenary summary of the main findings of the three parts of the consultation.

The second and third sections summarise the findings from the Key Group Meetings and Focus Group Meetings respectively.

A brief fourth section outlines the nature of the Biology survey, but the Key Points from the survey are given in an appended report.

The Report on Findings from the Biology Draft Syllabus Survey gives a full statistical analysis of the responses to each question in the survey.

Further details of the discussions and concerns of the groups consulted may be found in the reports on individual meetings of the Key Groups and Focus Groups.

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Major Issues of Approval.

As a guide to discussion, the Board Curriculum Committee (BCC) prepared a list of General Questions for Consideration that were used for most meetings. These elicited a general support for many aspects of the Draft Syllabus that would otherwise, being non-controversial, have gone without comment.

The Preliminary Biology Course does build on the Stage 4/5 Science Course developed in 1998. The conceptual development from the Preliminary to the HSC Course could be improved, but was generally approved.

There was acceptance of the overall structure of the courses, with modules of core content, options, and division of time between practical experience and theory. The structure within a module (Context, Prescribed Focus Areas and Domains) was more familiar following its adoption for the Stage 4/5 Science Syllabus and drew little comment.

There was an enthusiasm to improve the Draft Syllabus underlining almost all of the criticism. None wished to abandon the revision and keep the existing course.

The Student Research Project aroused much discussion, but not about the skills developed nor the excitement of practicing science in the real world: most concern (see later) was about implementation,
monitoring, resources and assessment.

Major Issues of Concern and Recommendations

Recommendation 1. The Target Candidature.
The Syllabus should be revised so that it includes a range of skills and content that make the Biology course accessible to student with a wide range of achievement in Stages 4/5. (Bands 3-6)

Recommendation 2. Implementation in 2002
The Stage 6 Biology syllabus should have its implementation delayed until 2002.

Recommendation 3. There is too much content.
The content and outcomes in all modules and options should be reduced to that amount that may, realistically, achieve Objectives 6-10 within the allocated time.

Recommendation 4. Student Research Project
A support document should be prepared to give guidance in the planning, introduction, monitoring, and assessing of SRPs.

Recommendation 5. Assessment benchmarks.
A support document should be prepared with sample assessment items and specimen answers to show the appropriate depth of study.

The necessary resources for study of all mandatory items should be audited for all modules, and the requirements should be kept within the reasonable budget of NSW schools.

Recommendation. Clarity of language.
The syllabus should include a glossary of terms used in the objectives and outcomes so that the meaning of each term is unambiguous. There should be an entry for each word intended to signify a mandatory task.

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Addressing the Concerns

The Target Candidature.
The White Paper following the McGaw report said: 'The curriculum for the HSC must be able to cater for the interests and abilities of the full range of students, without compromising standards or lowering expectations.'
The candidature for Biology, as for all sciences, has been declining and there is an expectation that new topics in relevant contexts might trigger enthusiasm in students and reverse this trend.
The Draft Biology Syllabus (2.2 p11) states that it is `designed for those students who have a substantial achievement level ... yet recognises that students entering Stage 6 have a wide range of abilities, circumstances and expectations.'

Most Key Groups and Focus Groups agreed that the Biology Syllabus does not meet these aims. `The new course is more difficult than the present course and this will lead to a reduction in the number of students studying Biology.' The course is not geared for the current students'; `About 6/180 would cope'; `The expectations are very high.' `Appropriate for only Bands 5-6 from S.C. level because of high level skills and depth/detail of knowledge.' Small schools may have too few students to form classes.

The Survey on Biology reports a `perception that the course is rather challenging and the concepts/content is theoretically too difficult for students at this stage.' Again, `that the amount of "assumed knowledge"
from Stage 4/5 to Stage 6 is unrealistic for students of this age.

Recommendation 1. The Target Candidature.
The Syllabus should be revised so that it includes a range of skills and content that make the Biology course accessible to students with a wide range of achievement in Stages 4/5. (Bands 3-6)

Implementation in 2002.
All four modules in the Preliminary Biology course emphasise that for Prescribed Focus Areas, Skills, Values and attitudes ...
'It is assumed that ... have been addressed during Stages 4-5'
The assumed knowledge includes 11 to 21 specific sections from Knowledge and Understanding in the Stage 4/5 Science syllabus.
Yet this necessary foundation of year 7-10 assumed knowledge will be taught first to the cohort entering Stage 6 in 2002.
The lack of preparation for the intakes in 2000 and 2001 was emphasised by 14 of the 15 group meetings.
The BCC makes a strong recommendation that the new stage 6 science syllabuses have implementation delayed until 2002.
Many other reasons for delaying implementation were given.
The draft syllabus includes use of technology: schools and systems need time and money to build up resources and teacher expertise. Time is needed for teachers to understand new content, find and develop resources. There is need for professional development, textbooks and support documents.
Teachers have a high current workload implementing the new stage 4/5 syllabus.

The Stage 6 Biology syllabus should have its implementation delayed until 2002.

There is too much content.
All discussion on the questions Are four modules .. appropriate? or Does 120 hours provide enough time..
brought emphatic statements that there is too much content.
Over the Preliminary and HSC courses it was estimated that there is more than double the content that can be taught in 240 hours. The process from now requires a programming feasibility study to reduce the amount of content consistent with the outcomes and leave time for conceptual development. What criteria should be used for culling?
In the Objectives and Outcomes Table (p20) the Objectives 1-5 are the Prescribed Focus Areas. Objectives 6-10 define the topics and key concepts selected for the course. When these Objectives have been confirmed, they should be used as a framework for linking the content in the modules back to these statements and hence into a coherent course. All other material (lacking these links) should be culled (BCC).
The Syllabus should reflect an interest in new topics and modern technologies .. but .. should not try to prepare students for the whole range of material they could meet in tertiary studies (Tertiary Specialists).
The definitions of Context in stage 4/5 were clear. In stage 6 they appear as theme statements artificially built from what is in the topic. A module needs to focus on sound conceptual development of a few outcomes -- not a lot as at present.

Recommendation 3. Too much content.
The content and outcomes in all modules and options should be reduced to that amount that may, realistically, achieve Objectives 6-10 within the allocated time.

Student Research Project (SRP).
The proposal for a Student Research Project aroused strong opinions
that at first seemed polarised (shown in the survey analysis) but, after discussion, it was apparent that the value of the SRP was recognised but the negative reactions arose from concerns over implementation, assessment, equity of resources and demands on student's time.

The introduction of the SRP had strong support from 5/8 Key Groups: 'The SRP is so worthwhile that other content/skills should be reduced to accommodate SRP better.' The reports on Key Group Meetings 1, 3 and 7 contain lists of problems or support relevant to SRPs.

There was opposition to SRP by two Focus Groups, great concern by two, and acceptance by three. This different reaction seems to relate to the presence in the Key Groups of teachers from schools that already include a form of SRP in their practical work.

Recommendation 4. Student Research Project
A support document should be prepared to give guidance in the planning, introduction, monitoring, and assessing of SRPs.

Assessment.
Most groups had assessment issues that they wanted clarified. Those relating to the SRP concern plagiarism, joint projects across subjects, class and small group projects, transfers from Biology to the HSC Science course leaving incomplete projects.

Assessment criteria must be set as benchmarks for teachers across all schools. These must allow a student who spends the planned 30 hours on a project to equal the mark of another student who spends 30 plus many private hours. Guidance on these matters is essential. The Sample Assessment Items in the Draft Syllabus Package were not satisfactory. It was thought ludicrous that one multiple choice question worth 1 mark could test 10 outcomes, including all PFAs.

Recommendation 5. Assessment benchmarks.
A support document should be prepared with sample assessment items and specimen answers to show the appropriate depth of study.

Resources.
The statements "Students will learn about" and "Students will learn to" imply a mandatory study and practical experience of this content. Many groups were concerned that the language used to define course outcomes and content was not precise, did not give an indication of the depth of study, and could make unreasonable demands on staff and students if given its usual meaning.

The necessary resources for study of all mandatory items should be audited for all modules, and the requirements should be kept within the reasonable budget of NSW schools.

Language.
Apart from the use of 'will' there were other words that did not give a clear meaning. There are 16 verbs in the Objectives and Outcomes Table (p20-21) 16 more in the Biology skills, and another 14 in the modules.

There is a need to clarify words like evaluate, design, dissect and, in particular, research. 'Will' has legal implications also: perhaps 'should' is adequate. Is it intended (p50) that 'all reference material accessed' should have copies provided? Surely 'acknowledge... with accurate references.' is sufficient.

Recommendation. Clarity of language.
The syllabus should include a glossary of terms used in the objectives and outcomes so that the meaning of each term is unambiguous.
There should be an entry for each word intended to signify a mandatory task.

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A. KEY GROUP MEETINGS

A Sequence of 8 meetings was held on 20-21 April 1999 in Sydney with representatives of the following groups ---

- Systems; Tertiary Specialists; Tertiary Educators;
- Board Curriculum Committee; Unions; Final Year Students;
- Interest Groups; Principals' Associations.

The Consultation Process requires that the BCC play a key role in providing comment on each syllabus as it is developed. They prepared a list of 23 General Questions for Consideration that were used by most of these meetings to structure the discussion.

All meetings were attended by an independent evaluation team that prepared a summary report on the opinions and discussion. These reports were submitted later to those attending for verification or correction.

The evaluation team for Biology consisted of:

- B. McAdam, (Chair), University of Sydney;
- G. Alexander, Sarah Redfern High School;
- C. Cochrane, Eagle Vale High School;
- S. Ezzy, De La Salle College;
- B. McInnes, University of Sydney;
  assisted by S Dufficy, Assessment, BOS.

This report gives a summary of the findings from all eight Key Group Meetings. The reports from the individual meetings are appended.

General Discussion.

Where most groups had similar concerns, the matters have been discussed above as major issues. Although each Key Group was representing a different part of the educational community, there was a common response to most of the questions listed by the BCC.

Responses to some of the General Questions for Consideration:

* 1 Does Preliminary Biology build on the Stage 4 and 5 course? The general answer was yes, but followed immediately with a proviso that students entering Stage 6 in 2000 and 2001 will not have the skills nor assumed knowledge from Stage 4/5. This will only come through the system completely in 3 or 4 years time.

* 2 Are four modules in the Preliminary courses appropriate? The number 4 has little significance. It is the content of the modules that counts. The practical nature of science demands that the course has a strong emphasis on the skills. There is inadequate time for teaching skills in Stage 4/5 or Stage 6. A suggestion was that one preliminary module be replaced with a module explicitly teaching experimental design, data collection and analysis and safety. The displaced module might be shifted to the HSC year and a present HSC module made optional.

* 6 Who is the audience for the Biology course? Biology will appeal to a wide range of students, but suitability will depend on how content is reduced and how the exam is set out. In its present design, only able students will keep up with the pace needed
to work through the content. The new syllabus is more rigorous than before and will exclude many mid-ranking students. Biology is scaling up.

* 7,14 Is it appropriate to include a Student Research Project in the preliminary/HSC Biology courses? Science should have been the first to have projects ... decades ago. There are huge practical issues. A school will face projects in stage 4/5 as well as stage 6 and in many other subjects. The SRP may become trivial or restricted by resources. If SRP go ahead then very clear guidelines to teachers and students are needed in support documents. Eventually stage 6 will follow a SRP in stage 4/5 where basic skills are learned. Experience shows a lot of teacher input is needed but the skills are valuable and have positive outcomes. Those schools that already have SRPs are strongly in favour of them. There are great difficulties in valid and fair marking if the SRP is included in assessment. The HSC exam assessment can only be general - and probably repetitive after some years. Home resources pose a problem in supervising that SRP is the student's own work.

HSC course

* 10 Is the range of Options appropriate? what else to include? The options listed should be reviewed when they are fleshed out. The lack of detail precludes any judgement now. One suggestion was that there should be new options introduced at intervals of years to allow students to sample current research fields.

* 16 Do the contexts provide ample scope to develop the PFAs, knowledge and understanding and skills? It is appropriate to have contexts. Some in the Syllabus (like 2.9.4) are misleading. Others do not relate well to the content. There is a confusion rather than focus in those modules with many PFAs. There should not be more than 2 in any module.

* 18 Are the skills within each module realistic and achievable? The SRP should be the main module for teaching skills.

Other Issues

* 19 What do you want/need in a Stage 6 Support Document? There is the general issue of support - much more than a document. 1. Annotated bibliography to support the background knowledge of teachers. This needs to be updated regularly for new content areas. 2. Information on excursions. 3. The location of resources in texts, web sites, journals. 4. Major inservice courses. These are essential since most teachers will not have studied the new content. There is intensive need over 2 years for inservice courses. Need to consider access for isolated schools. 5. List of Australian examples in support material.

Staff need to teach Stage 4/5 for a time to become familiar with the modular structure of the new science courses. Most staff have not kept up reading in Biology, and need time to absorb new topics and techniques.

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B. FOCUS GROUP MEETINGS.

were held at regional schools in NSW between 19 and 23 April 1999. Each involved from 6 to 17 persons selected from neighbouring schools (in all systems) to represent a cross-section of teachers - trainee science teachers, those with 10 years or 15 years experience, recently appointed head teachers, and experienced head teachers.
Reports on the discussion were received from seven Focus Groups by 4 May 1999. This report gives a summary of the findings from the seven meetings.

1. Ballina HS, 2. Barham HS, 3. Lucas Heights Community School,
4. Mount Austin HS, 5. Parramatta Marist HS,
6. St Patrick's College, Goulburn, 7. Tenterfield HS.

General Discussion.

Some groups had concerns beyond the general questions. The academic level is a challenging one, too high compared to the candidates Biology attracts at present.

All groups agree there is too much content. Module 1 had most criticism ...seems to collapse 3 units from the present syllabus into 7 weeks; has 35 content points and 22 skills to cover in 7 weeks. There were several comments about too much emphasis on genetics and evolution. The language need attention, especially in the Contexts.

Responses to some of the General Questions for Consideration:

* 1  Does Preliminary Biology build on the Stage 4 and 5 course? Yes, in general, but there is a large depth and breadth of the assumed knowledge from 4/5 and this will not be available until 2002. Students leaving year 10 in 1999 and 2000 will not have the background.

* 2  Are four modules in the Preliminary course appropriate? It is not the number, but the appropriateness of content that matters. cognitive skills, depth, rigour, structure and sequence. would prefer modules of more even duration.

* 3  Does the Preliminary course provide a coherent stand-alone course? No. because of assumed knowledge, and overlap of SRP with the HSC year. Group 7 said yes, and students could easily transfer to another course.

* 4  Does the Preliminary course in Biology underpin the HSC Biology course? Divided opinion! Group 6 said some of the HSC was needed to underpin the Preliminary course. Another (2) suggested that relevant Preliminary outcomes should be included in the HSC assumed knowledge (in 2.10) as well as 4/5 outcomes.

* 5  Does 120 hours for the preliminary course provide enough time to cover the knowledge, understanding and skills? Unanimous NO. Time is further increased by need for revision of 4/5 material. Too many compulsory practicals (eg. Modules 1, 2). Ridiculous expectation; far too long. Need more discussion about how and where to cull content.

* 6  Who is the audience for the Biology course? The course is designed for middle to upper level students and will not cater well for the less able students. The concern is both the level of content, and the amount of it. In small schools, may not even form a class. The more academic and self-motivated students would select this course. Group 7 felt it was targeted to a higher academic group - 1st year university level. There was a lack of an appropriate course for lower-ability students doing science.

* 7,14 Is it appropriate to include a Student Research Project in the preliminary/HSC Biology courses? There was a divided opinion. Four groups said yes; three favoured a SRP in the Preliminary course. Group 6 had considerable concern about the SRP
and gave a succinct summary of objections. It was thought that
the content of the HSC modules would have to be reduced or the SRP removed.
Group 3 had many objections, but if a SRP was necessary, then it should
be in the Preliminary course only.
Group 1 said NO, not a good idea. Not under current conditions.
The skills are adequately covered in class. There are huge practical issues.

HSC course

* 8 Does the conceptual development in the HSC course build on the
   Preliminary course?
   Four groups said yes, but Group 1 thought
   the ideas show virtually no linkage except for the evolution theme.

* 9 Are four modules appropriate in the HSC course?
   Four modules were generally accepted. There was the overriding concern of
   too much content. More information on the Options is imperative.
   There was the feeling that the new course was mostly the old course
   renamed and randomly mixed.

* 10 Is the range of Options appropriate? what else to include?
    The range is not broad enough both in content and difficulty.
    Generally, there is too little information to answer.
    Immunology is inappropriate and a poor replacement
    for the present Human Disease topic. Polygenetic inheritance was questioned.
    Suggested topics - Animal behaviour; Horticulture; Classification;
    Marine Biology; Ethics in Biology; Human Disease; VOCED topics.

* 11 Is the number of options appropriate? delete? add?
    Could reduce the core and put in more options. Have 1 option and use
    the time for the SRP.

* 12 Is it appropriate to offer Options?
    Yes! to cater for range of interests, give student choice, take
    advantage of teacher expertise, better use of resources.
    It was noted that it was a class option; not a student option.

* 13 Does the HSC course in 2-Unit Science provide a coherent stand-alone
   course?
   The Science course is the closest to being internally comprehensive and
   hence stand alone. There are interesting topics, but the course is
   pitched too high, and may turn students (especially the less
   academic students) away from science.

* 14 Is it appropriate to include a Student Research Project in the HSC course?
   (see Q7).

Domain, Contexts and PFAs

* 15 Are the contexts appropriate?
   They give a basis and relevance to the outcomes. However, the expression
   is complicated and needs simpler language.

* 16 Do the contexts provide ample scope to develop the PFAs, knowledge
   and understanding and skills?
   Yes! but also `They are vague enough to provide scope for anything.'

* 17 Is there a conceptual development within each module?
   Generally NO! Comments were erratic; jumps around. Specific examples
   are given on p37 (2 is needed before 1) and p43 (3 jumps from classification
   to implication for disease infinal two dot-points).

* 18 Are the skills within each module realistic and achievable?
As with the content, there is not enough time to develop the range of skills demanded.

Other Issues

* 19 What do you want/need in a Stage 6 Support Document?
The emphasis was on much more than a document. Some detailed lists of support are given separately. General requests were for:
- details of content and outcomes for the optional modules.
- model programs.
- resources for the SRP: suggested topics, references, marked examples.
- specimen exam paper with marking schemes and scales.
- specific web sites and email addresses.

* 20 Outline any Assessment issues?
Much more information is needed, especially about the SRP. If SRP goes ahead then very clear guidelines to teachers and students are needed in support documents. There are great difficulties in valid and fair marking if included in assessment. Any assessment must be very general - Need criteria for marking. More information on the Bands in the Performance Scale.

* 21 Does there appear to be a significant overlap between Biology and any other Stage 6 course?
Group 6 mentioned overlap with Geography, PDHPE and the Earth and Environment Science courses. Others such as Agriculture have not been examined. Most groups had not looked at other courses.

C. SURVEY

The Survey questionnaire was sent to all secondary school in NSW, the Board’s consultative network, tertiary science specialists, tertiary educators, teacher unions, professional associations, parent and community organisations and to a random selection of primary schools. There were 195 replies to the Biology Survey by Friday 30 April. Despite the wide distribution, the typical respondent is described as an individual (72%), based (87%) in a secondary school (92%), with more than 600 students (63%). The teacher is probably in a classroom and has 6 or more years of teaching experience (87%). However, the schools are very representative of those in NSW and are distributed over all locations, nature of school and education system. The detailed report on the findings from the Biology Draft Syllabus Survey has been prepared. The key points from the survey are appended.

End