



**Physics
Stage 6**

**Draft Writing Brief
Consultation Report**

February 2016

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1. Background information

The preparation of the *Physics Stage 6 Draft Writing Brief* took into account the broad directions for the learning area, which were developed following public consultation and endorsed by BOSTES in December 2014.

BOSTES conducted consultation in Term 4, 2015 to engage stakeholders in the syllabus development process and to seek their feedback on options and proposals in the draft writing brief.

The consultation program included:

- a meeting of the Years 11–12 Board Curriculum Committee for Science on 18 November 2015
- afternoon consultation meetings at:
 - Parramatta on 26 October 2015
 - Albury on 27 October 2015
 - Port Macquarie on 29 October 2015
 - Merimbula on 2 November 2015
 - Hurstville on 4 November 2015
 - Asquith on 5 November 2015
 - Sydney on 26 November 2015
- an online survey on the BOSTES website from 19 October to 29 November 2015
- written submissions from:
 - NSW Department of Education
 - Catholic Education Office Sydney
 - Communities of Catholic Schools – Diocese of Broken Bay
 - Association of Independent Schools of NSW
 - Association of Heads of Independent Schools of Australia
 - Association of Independent Schools of NSW
 - CUDOS Centre of Excellence, University of Sydney
 - NSW Teachers Federation
 - STANSW
 - University of NSW Faculty of Science
 - University of Sydney Faculty of Science
 - Blue Mountains Grammar School
 - Gosford High School
 - Sydney Grammar School
 - 3 individuals.

Professional associations and schooling sectors conducted a range of activities during the consultation period to inform feedback to BOSTES.

Feedback from consultation was analysed and informed revisions to the draft writing brief. The final writing brief will be used to develop the draft syllabus.

2. Executive summary

The *Physics Stage 6 Draft Writing Brief Consultation Report* provides a description of the consultation process and a summary and analysis of feedback received. The summary analysis outlines confirmation of the general directions of the draft writing brief as well as key matters raised and proposed actions and amendments.

The Consultation Report presents data and findings gathered through 157 survey responses, 17 written submissions, a Board Curriculum Committee meeting and 7 consultation meetings.

The *Physics Stage 6 Draft Writing Brief* provided three course options for analysis and feedback. Stakeholders indicated that Option 2, with a four-topic structure, no options and a focus on practical expectations, was preferred. There was, however, strong agreement that depth studies incorporating investigative projects could provide for deeper learning and cater for the needs of a broad range of students (Option 3). Respondents noted that further information and detail about the structures, requirements and assessment of depth studies was needed before Option 3 could be considered.

There was strong support for further quantitative analytical aspects to be incorporated into the new syllabus.

Other matters raised included the need for further refinement of the rationale, aim, objectives and outcomes, a reduction in the content to allow for depth of study and to support students learning about contemporary science as it is practised. Respondents also supported development of an extension course/s in sciences. It was suggested that assessment requirements be clarified, and learning materials would be required to support implementation.

Key matters

The key matters to emerge from the consultation included:

- Option 2 is preferred. However, there is strong support for Option 3 with its depth study components.
- the rationale, aim and objectives require some revision to provide more clarity and consistency of purpose about the principles of physics
- there is a need for quantitative analytical emphasis in the course, with a focus on physical understanding, modelling, and problem-solving using data analysis
- the concept of depth studies is supported; however, assessment for the HSC requires clarification
- the Physics syllabus should emphasise learning science as it is practised, and promote practical investigations and activities
- development of an Extension course(s) for sciences should be considered
- Senior Years assessment policies, procedures and requirements need clarification.

Actions in response to key matters

- Aspects of Options 2 and 3, including depth studies, will be incorporated.
- The rationale, aim and objectives will be reviewed and amended to provide clarity and consistency.
- Quantitative analytical aspects will be included and addressed through a review of the modules and areas of study.
- Depth studies will be included and details about their nature and structure will be provided.
- Where appropriate, practical investigations and activities will be included to enhance and complement content.
- An Extension course(s) in Science will be considered for development following draft syllabus development in the science courses.
- Senior Years assessment policies and procedures will be reviewed during draft syllabus development.

A summary of key matters and related actions is contained in Section 4 of this report.

3. Summary of respondents

Consultation stakeholder and teacher meetings

1 Board Curriculum Committee (BCC), 7 teacher meetings

BCC members	8	Government sector	74	Catholic sector	26
Independent sector	48	Other	9		

Online survey respondents

157 online survey responses

Respondent:					
Academic	4	Parent	0	Pre-service teacher	1
Principal	1	School executive	14	School faculty	8
Student	20	Teacher	106	Other	3
I am:					
An Aboriginal person	0	A Torres Strait Islander person	0		
An Aboriginal and Torres Strait Islander person	1	Not an Aboriginal and/or Torres Strait Islander person	156		
Sector:					
Government	74	Catholic	26		
Independent	48	Non-school based	9		
Area of NSW:					
Metropolitan	100	Regional	57		
Number of people contributing to this survey:					
1	141	2–5	12	6 or more	4

4. Key matters

Key matters	Actions
<p>Option 2 is preferred. However, there is strong support for Option 3 with its depth study components.</p> <p>The rationale, aim and objectives require some revision to provide more clarity and consistency of purpose about the principles of physics.</p> <p>There is a need for quantitative analytical emphasis in the course, with a focus on physical understanding, modelling, and problem-solving using data analysis.</p> <p>The concept of depth studies is supported; however, assessment for the HSC requires clarification.</p> <p>The Physics syllabus should emphasise learning science as it is practised, and promote practical investigations and activities.</p> <p>Development of an Extension course(s) for sciences should be considered.</p> <p>Senior Years assessment policies, procedures and requirements need clarification.</p>	<p>Aspects of Options 2 and 3, including depth studies, will be incorporated.</p> <p>The rationale, aim and objectives will be reviewed and amended to provide clarity and consistency.</p> <p>Quantitative analytical aspects will be included and addressed through a review of the modules and areas of study.</p> <p>Depth studies will be included, and details about their nature and structure will be provided.</p> <p>Where appropriate, practical investigations and activities will be included to enhance and complement content.</p> <p>An Extension course(s) in Science will be considered for development following draft syllabus development in the science courses.</p> <p>Senior Years assessment policies and procedures will be reviewed during draft syllabus development.</p>

5. Analysis

5.1 Rationale

Summary

The majority of survey respondents agreed that the proposed rationale describes the nature of the course in broad terms, explains its purpose in the curriculum and reflects a contemporary view.

Some respondents noted that the rationale should make reference to the mathematical nature of the subject, its challenge and the value an understanding of physics brings to understanding the world around us.

A small number of respondents indicated that the rationale should be revised to target a broader range of students.

Feedback affirming the rationale

Feedback	Sources
The proposed rationale describes the nature of the course, explains its purpose in the curriculum and reflects a contemporary view.	AHISA BCC DoE Parramatta (CM) STANSW Submission 4 Survey (x4)

Key matters and actions

Key matters	Sources	Actions
The rationale needs to further reflect the mathematical nature of physics.	Albury (CM) Submission 1 Survey (x7) UNSW USYD	The rationale will be reviewed and amended to reflect the mathematical nature of physics.
The rationale needs to emphasise the value of the interplay of knowledge, understanding and scientific skills to develop a deeper understanding of natural phenomena.	Submission 2 Survey (x8) UNSW	The rationale will be amended to emphasise the relationship between learning scientific knowledge and its applications.

5.2 Aim

Summary

The majority of respondents agreed that the proposed aim provides a statement of the overall purpose of the syllabus.

Some respondents suggested that the aim should be more explicit about the mathematical nature and refer to models and theories in physics, or that there should be increased emphasis on the importance of experimental investigation.

Feedback affirming the aim

Feedback	Sources
The proposed aim is clear and provides a statement of the overall purpose of the syllabus.	BCC Port Macquarie (CM) STANSW

Key matters and actions

Key matters	Sources	Actions
The aim should emphasise the mathematical nature of models and theories in physics and the role of experimental investigation.	Asquith (CM) Submission 1 Survey (x9) UNSW USYD	The aim will be reviewed to emphasise the mathematical nature of models and theories in physics and the role of experimental investigation.

5.3 Objectives

Summary

The majority of respondents agreed that the proposed objectives define in broad terms the knowledge, understanding, skills, values and attitudes developed through studying this course.

Several respondents commented that the objectives require clarification with specific reference to applications of physics and problem-solving.

Feedback affirming the objectives

Feedback	Sources
The proposed objectives define in broad terms the knowledge, understanding, skills, values and attitudes to be developed through study in this course.	BCC Port Macquarie (CM) Submission 5

Key matters and actions

Key matters	Sources	Actions
The objectives require specific reference to problem-solving and the application of physics principles.	AIS Submission 1, 2 Survey (x9) UNSW USYD	The objectives will be reviewed to reference problem-solving and applications of physics principles during syllabus development.

5.4 Outcomes

Summary

The majority of the respondents agreed that the sample of outcomes describe the knowledge, understanding and skills expected to be developed.

Several respondents commented that the outcomes require clarification, and they should focus on the development of skills and understanding rather than factual recall.

Feedback affirming the outcomes

Feedback	Sources
The sample of outcomes is suitable and reflects the aim of the course.	AHISA BCC DoE Merimbula (CM) Port Macquarie (CM) STANSW Survey (x5)

Key matters and actions

Key matters	Sources	Actions
The outcomes require greater clarification to emphasise the development of knowledge and skills through practical investigations.	AIS CEOSYD STANSW UNSW Submissions 1, 2, 3, 5 Survey (x14)	The outcomes will be reviewed to emphasise the development of knowledge and skills through practical investigations.

5.5 Diversity of learners

Summary

Many respondents commented that the nature of Physics made it difficult to provide for all learners and that the course should be aimed at mathematically able students. A small number of respondents suggested that the Senior Science course include Life Skills outcomes and content to provide for the diversity of students.

A large number of respondents indicated that depth studies, open-ended investigations or other experimental work offered scope for catering for the diversity of learners and should be included in the syllabus. A number suggested that logistics, equity and assessment were issues related to depth studies.

Feedback about the diversity of learners and Life Skills outcomes and content

Feedback	Sources
The mathematical nature of physics targets students with substantial achievement in both science and mathematics.	BCC Hurstville (CM) STANSW Submission 1 Survey (x10)
Depth studies incorporating investigative projects, open-ended investigations and other experimental work allow for a diversity of learners.	AIS BCC CEOSYD Merimbula (CM) Parramatta (CM) STANSW Submission 3 Survey (x12)

Key matters and actions

Key matters	Sources	Actions
The Physics course does not lend itself to the development of Life Skills outcomes and content.	AIS BCC CEOSYD Merimbula (CM) Submission 1 Survey (x27)	Life Skills outcomes and content will be developed to align with the Senior Science course.
Heavily prescribed content or contexts hinder the ability to provide for diversity of learners.	Parramatta (CM) Submissions 1, 3 Survey (x5)	A reduction of content will be achieved through review of the scope and breadth of learning associated within each area of study.
Depth studies may raise issues about equity, assessment and logistics.	AHISA NSWTF Submissions 2, 5	Depth studies incorporating investigative projects will be included, and additional advice provided.

5.6 Course structure and options

Summary

Preferred option

The majority of survey respondents preferred Option 2. The next preference was Option 3 and then Option 1.

Those who favoured Option 2 indicated that the depth studies incorporating investigative projects of Option 3, whilst attractive with its proposed depth study, may raise significant equity, logistical and assessment issues for schools.

It was suggested that Option 3 should be considered for the Year 11 course and Option 2 for the Year 12 course.

Course content

The majority of survey respondents agreed that the sequence of content and areas of study presented in Options 2 and 3 are logical, appropriate and contemporary and meet the needs and interests of a range of students.

A large number of respondents indicated that the mathematical and conceptual rigour of the course needs to be increased. These respondents commented that a greater emphasis on an understanding of physical concepts, problem-solving and skills is necessary to ensure the course adequately prepares students for further study.

Several respondents commented that the Year 12 units of work are too focused on modern physics, do not promote experimental work and may favour factual recall over the development of physics skills and understanding.

Several respondents noted that some aspects of the present course, such as the Medical Physics and Astrophysics options, should be retained.

A common multidisciplinary unit

Most survey respondents indicated that a multidisciplinary unit was not required as this was well catered for in Stage 4 and Stage 5 Science.

Depth studies

The majority of survey respondents agreed that depth studies, incorporating investigative projects, provide opportunities for students to apply their scientific knowledge, understanding and skills. A large number of respondents commented that depth studies would enable flexibility, meet the needs of the diversity of learners, motivate students and encourage the application of science knowledge and skills to engage with deeper learning.

Additional quantitative aspects for consideration

Survey respondents were divided as to whether additional quantitative analytical aspects should be considered for inclusion in this course.

Some suggested quantitative branches of physics for inclusion were thermal physics, rotational dynamics, simple harmonic motion, quantitative error analysis.

An Extension course

Most respondents supported the development of an Extension course in Physics. There was support for consideration of an Extension course(s) in Science.

Respondents noted that the nature of the proposed Extension course(s) required greater clarification.

Other structures and options

The majority of survey respondents indicated that the course structures and options were appropriate.

Feedback affirming the course structure and options

Feedback	Sources
<p>Course content</p> <p>The content is appropriate and contemporary, prepares students for future study and is flexible in meeting the needs and interests of the range of students.</p>	<p>AHISA BCC Parramatta (CM) Survey (x14)</p>
<p>Depth studies</p> <p>Depth studies incorporating investigative projects are supported.</p>	<p>AIS BCC CEOSYD Merimbula (CM) STANSW Submission 4 Survey (x17) Sydney (CM) USYD</p>

Key matters and actions

Key matters	Sources	Actions
<p>Course content</p> <p>Organisation of the course should focus on understanding of fundamental physics concepts and skills, including mathematical and problem-solving skills.</p>	<p>Asquith (CM) CCSOBB DoE NSWTF Parramatta (CM) Submissions 1, 2, 3 Survey (x34) UNSW USYD</p>	<p>The content will be reviewed to focus on developing understanding of fundamental physics concepts and skills, including mathematical and problem-solving skills.</p>
<p>Year 12 topics are too focused on modern physics, not allowing for experimental work and are likely to lead to rote-learning.</p>	<p>Asquith (CM) Submissions 1, 2, 3 Survey (x10) UNSW USYD</p>	<p>Opportunities for experimental work will be provided in the draft syllabus.</p>
<p>Some content from the present course should be retained (eg Medical Physics, Astronomy).</p>	<p>Asquith (CM) NSWTF USYD</p>	<p>Content will be reviewed to incorporate core learning.</p>
<p>Depth studies</p> <p>The nature of the proposed depth studies is not clear, and the introduction of depth studies may present significant logistical and assessment challenges.</p>	<p>AHISA Asquith (CM) BCC DoE Hurstville (CM) Parramatta (CM) NSWTF STANSW Submissions 1, 2, 4, 5, 6 Survey (x40) USYD</p>	<p>Advice about the nature and structure of depth studies incorporating investigative projects will be provided in the draft syllabus.</p>
<p>Additional quantitative aspects</p> <p>Additional quantitative aspects of physics should be introduced into the syllabus.</p>	<p>CCSOBB NSWTF Submissions 2, 3 Survey (x14) UNSW</p>	<p>The inclusion of quantitative analytical aspects content will be considered.</p>

Key matters	Sources	Actions
<p>Extension course An Extension course in Physics or an Extension course(s) for Science is supported.</p>	<p>AHISA AIS Asquith (CM) CCE DoE Hurstville (CM) NSWTF Parramatta (CM) Submissions 1, 2, 4, 5, 6 Survey (x18) Sydney (CM) USYD</p>	<p>An Extension course(s) in Science will be considered for development following syllabus development in the science courses.</p>
<p>The nature of any Extension course requires greater clarification.</p>	<p>AIS BCC NSWTF STANSW Submissions 1, 2, 3 Survey (x5) UNSW USYD</p>	<p>Clarification about a Science Extension course will be provided in the syllabus.</p>

5.7 Assessment

Summary

A significant number of respondents indicated that school-based assessment is well supported. Some respondents requested further guidance in relation to school-based assessments.

Several respondents commented on the logistics of practical or research-based tasks, and that the current 50% maximum limit on exam-based assessment should be reconsidered.

There were differing opinions about the role of technology in external assessment. Some respondents indicated that some aspects of the assessment process could be completed online; but there was no consensus on which aspects.

Feedback affirming the information on assessment and reporting

Feedback	Sources
The present system of school-based and/or external assessment is appropriate.	Survey (x22)

Key matters and actions

Key matters	Sources	Actions
The nature of internal and external assessment should be reviewed as part of syllabus development.	AIS Albury (CM) Asquith (CM) BCC Hurstville (CM) Merimbula (CM) NSWTF Parramatta (CM) Submission 1 Survey (x13)	HSC assessment policies, procedures and specifications will be reviewed.
External assessment tasks should focus on assessing skills and application.	AIS Hurstville (CM) Submission 1 Survey (x7)	Internal and external assessment specifications including HSC assessment policies and procedures will be reviewed during syllabus development.
Clarification is required as to whether both the Year 11 and Year 12 courses will be assessed.	DoE	
Further advice is required about the importance of assessing the practical components of physics.	AIS	
The use of technology in assessing students should be investigated.	BCC Submissions 1, 4 Survey (x9)	The use of technology in assessment will be considered during syllabus development.

5.8 Other comments

Summary

The majority of survey respondents agreed that the draft writing brief provides a sound basis for developing the course.

Feedback affirming the draft writing brief

Feedback	Sources
The draft writing brief provides a sound basis for developing the final writing brief, which is the blueprint for the development of the draft syllabus.	BCC DoE Merimbula (CM) Parramatta (CM) Port Macquarie (CM) STANSW

6. Quantitative analysis of survey responses

Note: Due to rounding, some percentages may not total 100%.

Survey Item	Number of responses	Strongly agree	Agree	Disagree	Strongly disagree	Yes	No
Rationale							
1. The proposed rationale describes the nature of the course in broad terms and explains its purpose in the curriculum.	129	18%	75%	7%	0%		
2. The proposed rationale reflects a contemporary view of the course.	129	14%	71%	12%	2%		
Aim							
3. The proposed aim provides a statement of the overall purpose of the syllabus.	127	17%	76%	8%	0%		
Objectives							
4. The proposed objectives define in broad terms the knowledge, understanding, skills, values and attitudes to be developed through study in this course.	119	17%	71%	13%	0%		
Outcomes							
5. The sample of outcomes is appropriate.	119	8%	72%	16%	4%		
Course structure and options							
6. Option 1 is preferred.	14					14%	
7. Option 2 is preferred.	48					48%	
8. Option 3 is preferred.	39					39%	
9. The sequence of content and areas of study presented in the options are logical and appropriate	102	24%	59%	13%	5%		
10. The content and areas of study in the options are contemporary	101	19%	65%	13%	3%		
11. The content and areas of study provide learning opportunities to prepare students to undertake further study	101	22%	60%	11%	7%		

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Survey Item	Number of responses	Strongly agree	Agree	Disagree	Strongly disagree	Yes	No
12. The structure and content provides flexibility to meet the needs and interests of the range of students	100	10%	71%	16%	3%		
13. A common multidisciplinary unit to commence the study of Stage 6 Science courses would focus students on the disciplines, and further develop common skills to assist students to choose appropriate discipline pathways	100	15%	38%	27%	20%		
14. Depth studies incorporating investigative projects provide opportunities for students to apply their scientific knowledge, understanding and skills.	101	33%	42%	15%	11%		
15. Are there additional quantitative analytical aspects that should be considered for inclusion in this course?	98					46%	54%
16. Is there another structure or option for Physics that BOSTES should consider?	94					35%	65%
General							
17. The draft writing brief provides a sound basis for developing the final writing brief, which is the blueprint for the development of the draft syllabus.	99	17%	70%	10%	3%		

7. Respondents

7.1 Consultation meetings

Afternoon consultation meetings (code: CM)

Location	Date (2015)	Total
Parramatta	26 October	73
Albury	27 October	8
Port Macquarie	29 October	14
Merimbula	2 November	5
Hurstville	4 November	60
Asquith	5 November	39
Sydney	26 November	26

Board Curriculum Committee consultation meeting at the BOSTES on 18 November 2015 (code: BCC)

Name	Organisation
Dr Timothy Wright	Chair
Mr Vatche Ansourian	NSW Department of Education
Ms Olivia Belshaw	Science Teachers' Association of NSW
Mr Robert Farr	Association of Independent Schools of NSW
Ms Regina Menz	Catholic Education Commission NSW
Mr Mike Morgan	NSW Teachers Federation
Mr Paul Reilly	NSW Department of Industry – TAFE NSW
Mr Tim Spencer	Federation of Parents and Citizens' Association NSW

7.2 Written submissions

Organisations, groups and individuals	Code
Association of Heads of Independent Schools of Australia	AHISA
Association of Independent Schools of NSW	AIS
Blue Mountains Grammar School Science Faculty	Submission 6
Catholic Education Office Sydney	CEOSYD
CUDOS Centre of Excellence, University of Sydney	CCE USYD
Communities of Catholic Schools – Diocese of Broken Bay	CCSOBB
Gosford High School Science Department	Submission 2
NSW Department of Education	DoE
NSW Teachers Federation	NSWTF
Science Teachers' Association of NSW	STANSW
Sydney Grammar School Science Faculty	Submission 1
University of NSW Faculty of Science	UNSW
University of Sydney Faculty of Science	USYD
Individual Respondent	Submission 3
Individual Respondent	Submission 4
Individual Respondent	Submission 5