

Report on consultation on Draft Themes and Topics for the Diploma in Science

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1. INTRODUCTION

As outlined in document QD3a version 2.0, this most recent consultation is on the proposed themes and topics for the Principal Learning aspect of the Diploma in Science. It, therefore, has a specific purpose in providing insight into and further advice for the qualifications development team on the way forward.

The consultation took place during September and October 2008.

This consultation covered the proposed themes and topics for the Principal Learning. The consultation questions related to:

- the proposed rationale and purpose for the Diploma in Science
- the guiding principles for the Diploma in Science
- the proposed themes and topics for the Principal Learning component of the Diploma in Science
- suggestions for possible content within the Additional and Specialist Learning component, and
- any foreseeable issues relating to equality of opportunity for learners

The feedback obtained during this consultation will be used to review, revise and further develop the content of the Diploma in Science during forthcoming work by the Project Team to produce the draft Line of Learning Statement of Content (QD9).

2. METHODOLOGY

Several strands of consultation activity have been used during the period of development in September and October. These were:

1. an online consultation survey questionnaire made available through the Diploma in Science website www.sciencediploma.co.uk
2. several workshop meetings facilitated by Ken Gadd¹

Other consultation activity has also been occurring but these have had a wider focus; for instance there was an initial meeting with Awarding Bodies to talk about the Phase 4 Diplomas and to open the door with regard to discussions on the

¹ Specialist Science Adviser to the SDDP Chair, Professor Hugh Lawlor

forthcoming development of the Science Line of Learning Statement and Criteria, and assessment thereof; and, phone interviews with employers and providers to acquire skills and qualifications are underway to gather specific information to feed into the Market View research.

The three workshops facilitated by Ken Gadd were arranged at the Institute of Biology, Institute of Physics and the Royal Society of Chemistry. In total 26 people from Schools/Colleges/Universities, the Learned Societies or employers or in their own capacity as Specialist Advisers or consultants attended the workshops. The participants discussed the vision, purpose and structure of the Diploma in Science and provided insight for content purposes from the perspective of each of the traditional disciplines. This was also helpful from a progression point of view. Summary notes from those workshops will be added to the next version of the QD6a.

2.1 Consultation documents

Two documents were developed by the Project Team specifically for consultation purposes:

1. A main consultation document² outlining the proposed structure, vision, rationale and purpose, themes and topics for the new Diploma in Science
2. An appendix to this document, offering further detail on the proposed topic content for Principal Learning at each of the three Diploma levels

The second document, the appendix, was provided separately for those stakeholders wishing to gain more insight into the proposed content of each topic and offer more detailed feedback on this issue. This enabled the main consultation to remain manageable for readers possibly coming to the Diploma in Science without any previous involvement, whilst also offering participants the opportunity to develop a more detailed picture of the Diploma and what it may entail, if so wished. The detail of the responses provided on the proposed Topic content contained within Appendix 1 are provided in a separate Annex.

The specific purpose of this consultation is the **Themes and Topics** for the Diploma in Science. This is the next stage of the development, and the second round of

² This had been through several iterations

consultation; the first sought views from a range of stakeholders on the initial scope on the Diploma in Science (July 2008) and which was reported on in QD 4a.

2.2 Online survey

The online survey was made available through the Diploma in Science website, although for those stakeholders not wishing to complete the questionnaire online it was also possible for a Word version of the survey to be downloaded from the website. This allowed stakeholders the option of completing the response either electronically or by hand without the requirement to remain online (useful for those wishing to consult with colleagues where a response was submitted, for example, on behalf of a whole organisation rather than an individual respondent). These responses could then be emailed or posted directly back to Pye Tait Limited.

In total, 264 responses were received of which 9 responses were received outside of the online format (7 by email and 2 by post). A breakdown by type of respondent is provided below.

Please note that as this survey was an opt-in exercise, respondents were self-selecting rather than making up a clearly stratified sample.

At the start of the survey, stakeholders were asked to choose the category which best represented the perspective from which they responded to the consultation. Therefore, the feedback presented throughout this report will sometimes represent the views of an individual rather than the organisation(s) to which they are affiliated. For example, an individual working within a science department at a university may have chosen to respond as a single 'science professional', rather than provide a response representing the view of an 'HE institution' as a whole – even though their experiences of working within HE may have informed their response.

Table 1: Survey respondents by stakeholder type (online survey)

| | (nos) |
|---------------------------------------|------------|
| Awarding Body | 6 |
| Employer | 17 |
| FE/6th form college | 18 |
| HE institution | 102 |
| Professional body/ association | 21 |
| School | 41 |
| Science professional | 21 |
| Sector Skills Council | 8 |
| Other | 30 |
| TOTALS | 264 |

| | (%) |
|---------------------------------------|------------|
| HE institution | 38.6 |
| School | 15.5 |
| Other | 11.4 |
| Professional body/ association | 8.0 |
| Science professional | 8.0 |
| FE/6th form college | 6.8 |
| Employer | 6.4 |
| Sector Skills Council | 3.0 |
| Awarding Body | 2.3 |
| TOTALS | 100 |

The 30 respondents selecting 'other' identified themselves as:

- Consultants (6)
- Education advisers – e.g. STEMPOINT contract holders (6)
- Individuals having experienced science education through to HE level (3)
- Curriculum developers (2)
- Local authorities (2)
- Science training providers (2)
- Scientific learned societies (2)
- Cluster organisation (1)
- Education department of a non-governmental organisation (1)

- HE Centre for Education Development (1)
- Knowledge Transfer Network (1)
- Learning and skills organisation (1)
- National education charity (1)
- Not specified (1)

Furthermore, 8 additional commentaries, in the main from learned societies, (not in direct response to the questionnaire) were received by email from those participating in the consultation and this feedback is also included within the analysis.

2.3 A summary of the online survey and the responses

The email alert about the survey was circulated to all those participating in the earlier consultation, members of the working groups organised by the DDP, those registering interest as of early September and email lists provided by the SSCs. This first email alert went out to over 300 organisations and individuals. However as the 8 SSCs also drew attention to the online survey via their e-newsletters and other similar means, it is unknown how many this finally reached nor how many that source prompted responses from.

As can be seen in the table above, a very high proportion of responses were received from Higher Education Institutions. In fact, altogether providers represented over 60% of the responses. The HEI voice dominated the additional literal responses supplementing the specific questions.

This predominance of the provider and in particular Higher Education voice is not surprising given the large numbers of HEIs and mixed economies institutions versus the relatively smaller number of learned societies and employer organisations³.

Work is ongoing within the SDDP to ensure greater participation by employers for future communications and consultation activities.

The large proportion of responses from the HE sector is, of course, welcome given the nature and focus of the Phase 4 Lines of Learning and the possible implications for progression and widening participation. It is also very helpful when looking, further on in the development of the Principal Learning, at the required knowledge,

³ Although there are potentially many employers requiring scientists or people with scientific skills, it is, at this early stage of development, not unexpected that employers may leave commenting to their employer representative organisations or associations.

skills and understanding for progression into HE.

This response has to be set in the context of those within it being more familiar and more comfortable with traditional entry arrangements and that these comments on the Diploma may have to be considered in the light of this possible predisposition.

2.4 Development work prior to the Consultation

There have been a number of iterations of a diagram portraying scientific activity in which varying degrees of biology, chemistry and physics knowledge and skills are required. The first diagram, consulted upon in July, was complex but suggested a first approach for the organisation of such scientific activities across three worlds that did not just rely on the traditional disciplines (see consultative document July 2008).

This diagram was received somewhat tentatively partly because it was impossible in a short time frame to consider it in full depth. Its approach was maintained and subsequently refined with a change of titles for the 'worlds' to Natural, Human and Technological.

The next iteration presented to the Steering Group (August 2008) was well received and seen as a good starting point for the vision for the Diploma in Science. This diagram again conveys the interdisciplinary nature with descriptors of the human, natural and technological worlds.

On moving this forward from the vision to the Principal learning component of the Diploma as each level, attention was given to organising the core scientific skills, knowledge and understanding. This manifests itself in the development of themes and topics. Presenting topics via a Venn diagram provided an excellent vehicle for further conveying this integrated approach. Whilst it seemed the best means to present the continuing approach of the overlapping areas it also encouraged some uncertainty over intended links between the vision of the interlinking 'worlds' and the proposed themes and topics. A replacement diagram of a triangle was used on this occasion.

The 'vision' itself is not the subject of this consultation, but it does set the scene for the further development work. The diagrams used in the consultation document are set out below.

During the consultation period, further iterations of the diagrams, the themes/topics have been developed and discussed at the three workshops. These have provided further insight into more engaging and perhaps more exciting ways of organising the knowledge, skills and understanding for the Principal Learning of the Diploma in Science.

To help illustrate the proposed structure of the Principal Learning for the Diploma in Science, a number of Venn diagrams were included within the main consultation document (copied again for reference below).

Figure 1: Proposed THEMES for the Diploma in Science

The proposed theme titles are in **BLUE** and bold

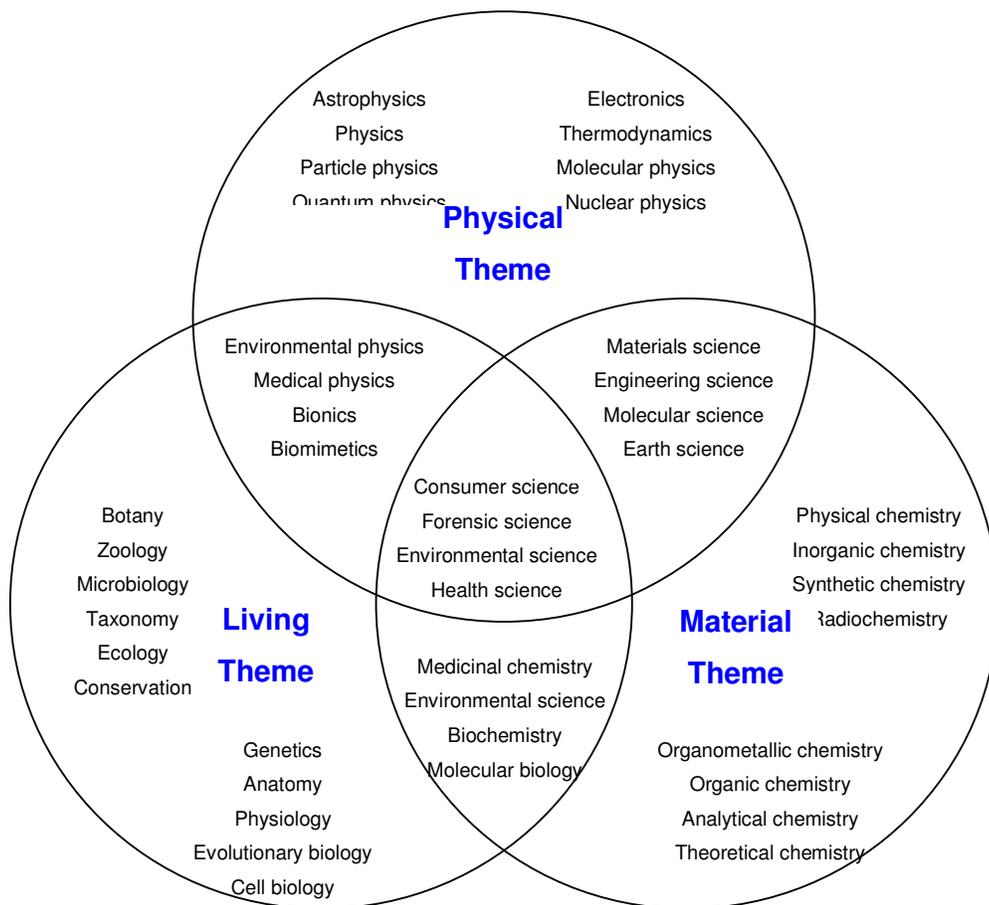


Figure 2: Proposed TOPICS for Principal Learning at Foundation level

Proposed Topic titles are in italics.

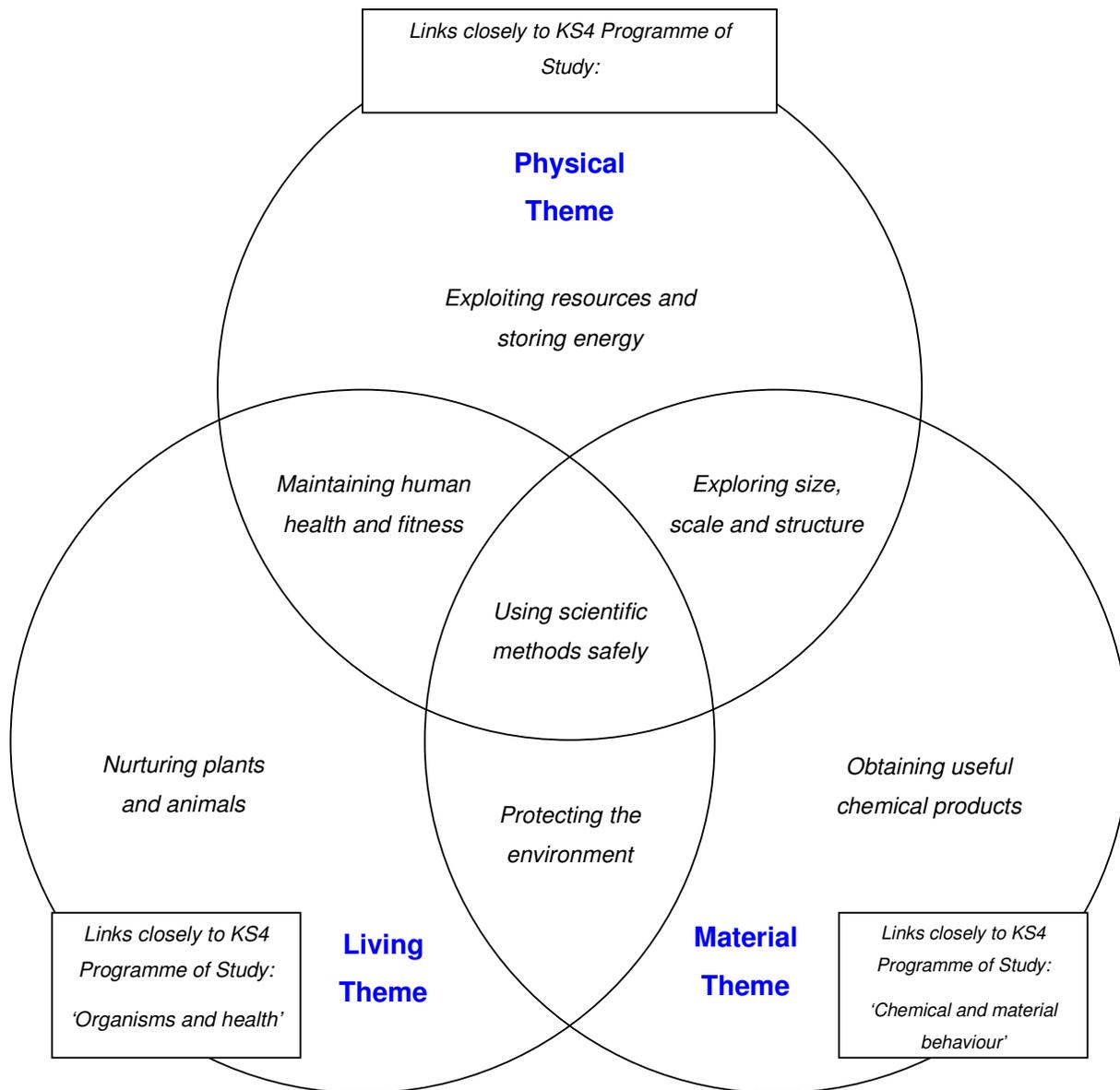


Figure 3: Proposed topics for Principal Learning at Higher level

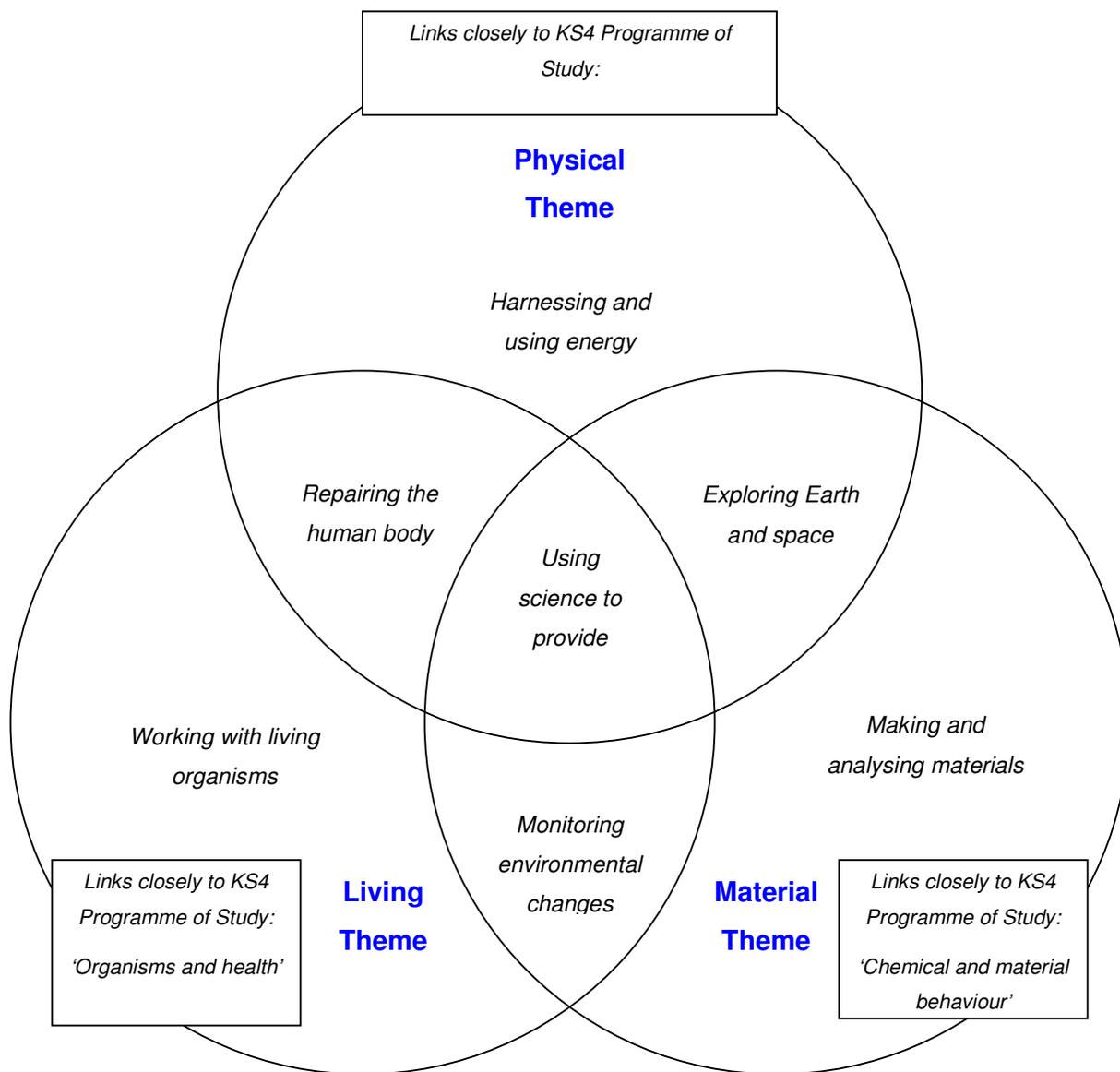
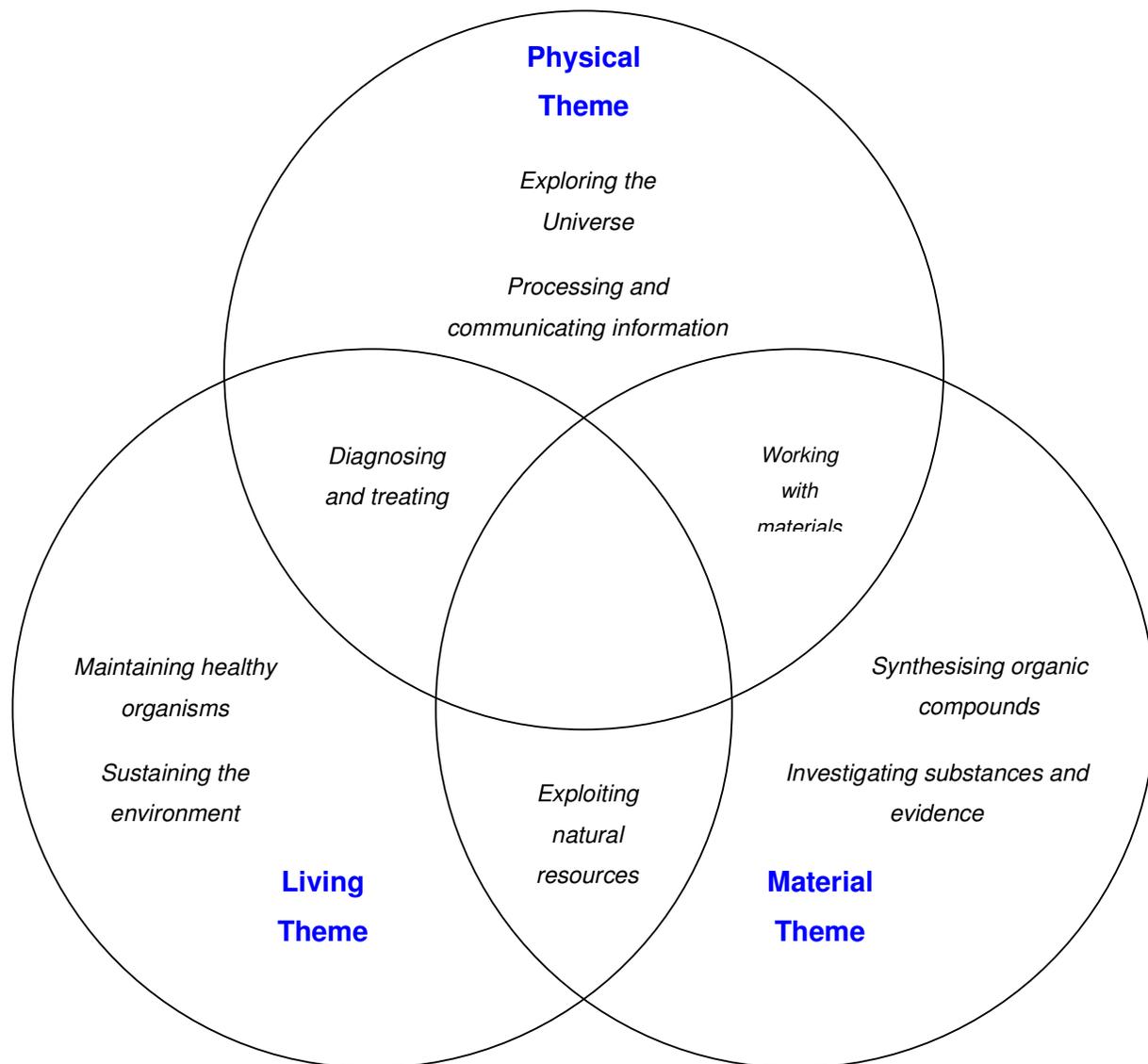


Figure 4: Proposed topics for Principal Learning at Advanced level



3. PRESENTATION OF FINDINGS

Guidelines

- *Clearly and succinctly present a **summary** of the information gathered. (More detailed information can be presented in an Annex if required).*
- *Clearly states the source of any data presented, including references to documents which may have been used during the course of the consultation.*
- *Includes a discussion of any differences of opinion on the proposed structure of the diploma at each level, and how these issues are being taken forward by the DDP during the next stages of development.*
- *Includes reference to any other suggestions for content development which may have come through the consultation process. For example, stakeholders may have suggested particular skills that could be developed in relation to a topic or suggested ideas for purposeful activities to support applied learning.*

The findings are presented in accordance with the consultation document and its key headings and sections.

- 3.1 Rationale
- 3.2 Purpose statements
- 3.3 Guiding principles for the (draft) themes and topics
- 3.4 Themes
- 3.5 Topics – per level
- 3.6 Suggestions of detail for the topics (Appendix 1 consultation document)
- 3.7 Equality and diversity issues for the learner
- 3.8 ASL possibilities

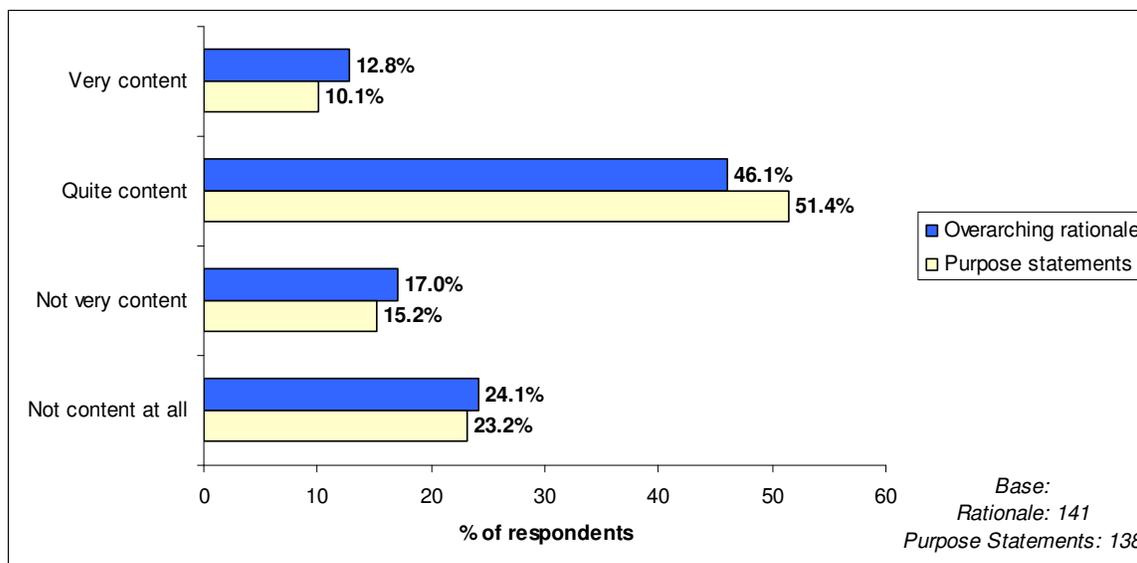
Other information has been fed into the consultation via a variety of means and this has been included within this report in appropriate places.

An overall summary is presented at the end of the document.

3.1 Rationale

Respondents are generally satisfied that the overarching rationale and general statements of purpose reflect the vision presented in the document. The split between being broadly satisfied and broadly dissatisfied for the rationale is 59: 41.

Figure 5: Contentment with overarching rationale and purpose statements



Source: Online Survey, Sept. 2008

KEY MESSAGES – on the overarching rationale

Comments here are based on literal responses (71)

Approximately a third of these stated that the statements should have a greater emphasis on, and reassurance about, the development **of scientific skills and knowledge** (i.e. understanding principles of science, scientific method).

This was followed by related comments, but by much less than a third :

- the contextualising of science – there is a wariness about the focus on contextualising science/ ‘real life’ issues/authentic workplace practice – either due to the perceived need to focus on learning scientific theory before applying it, or due to practical issues of engaging enough employers to help with this.
- the rationale needing to outline a clearer sense of purpose for the Diploma – how does it differ from the existing provision and where does it fit?

- language - key terminology posing a barrier – for example ‘scientific endeavour’, ‘enthusing someone’s capabilities’ – terms regarded as somewhat woolly or flowery.

3.2 General Purpose Statements

As Figure 5 also shows there is, in general, a positive reaction to the purpose statements with the split between broad satisfaction and broad dissatisfaction being slightly more positive for the purpose statements than for the overarching rationale (61: 39).

KEY MESSAGES – on the purpose statements

Comments here are based on literal responses (57):

The point was made again, this time by around a sixth of those providing additional commentary, on the need for greater emphasis on scientific knowledge and sufficient reference to the understanding of basic principles.

Around 1 in 5 of those providing comment added to this by wishing to see consideration of the depth of learning, which they see as important in order to allow learners to develop specialisms.

The inclusion of mathematics in the general purpose statements is welcome but two respondents query the use of the word ‘appropriate’.

3.2.1 Purpose Statements at each level

Figure 6 indicates a broad satisfaction with the purpose statements at each level, with the foundation level statements attracting the greater level of satisfaction.

KEY MESSAGES – on the purpose statements

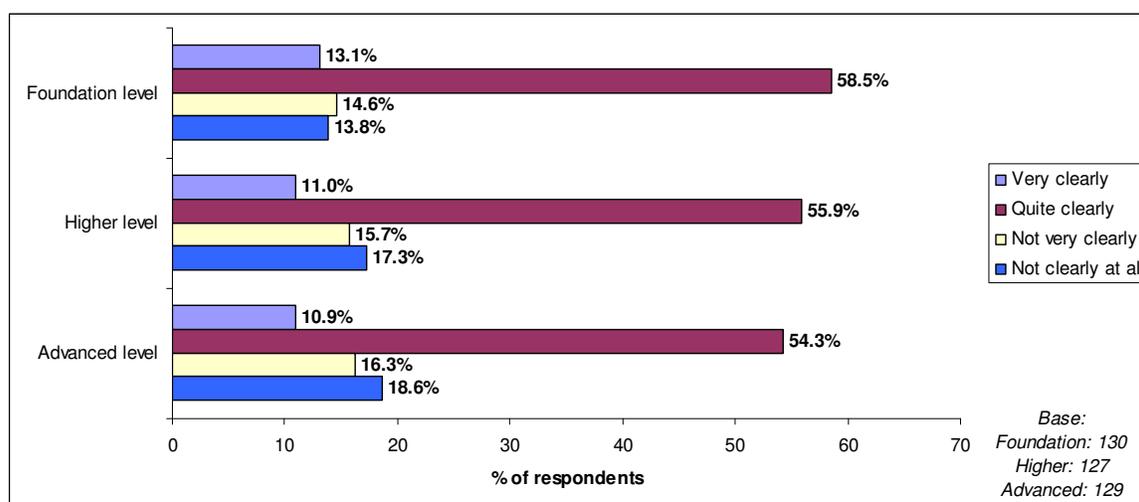
Comments here are based on literal responses (62):

A number of respondents (25) feel the purpose statements for each level are too vague, lacking detail particularly in the sections on ‘entry from..’ and ‘progression into..’, and in terms of the specific skills to be developed at each level.

- **Foundational level:** six respondents query how this is different from other provision; as there is mention of an ‘alternative approach’ –need to specify what the approach is an alternative to,

- **Higher level:** there is mention of providing a ‘quality’ qualification at this level but this is not mentioned at the other levels; **4 respondents** query how the purpose statements at Higher level make it different to existing provision; plus **4 respondents** suggest the need to state links to KS4 PoS – as is included in the Foundation level statements (and are in the venn diagrams),
- **Advanced level:** 6 respondents say they would like to see more explicit reference to the depth of subject knowledge at this level with 3 raising concerns here regarding the need for learners to be able to specialise in a particular area, as well as understand ‘interdisciplinary’ approaches.

Figure 6: How clearly respondents think the purposes statements are defined at each level

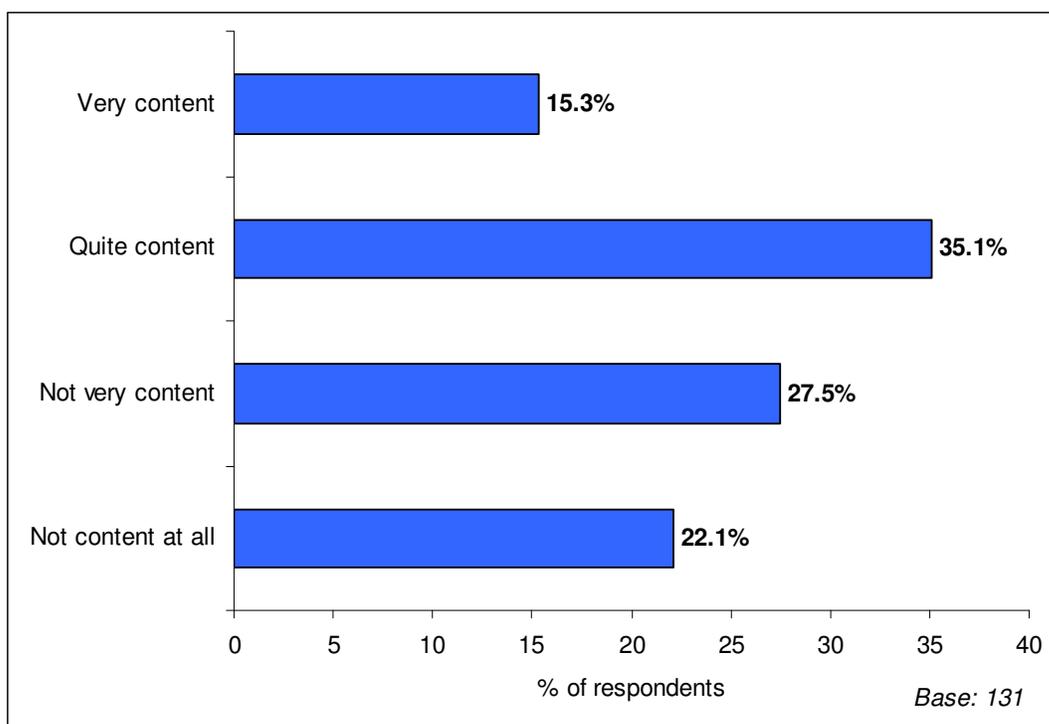


Source: Online Survey, Sept. 2008

3.3 Guiding Principles

The Guiding Principles have been drawn up to help with the construction of themes and topics, and so it forms an additional piece of information mainly for development and design purposes.

The survey indicates an almost exact 50:50 split between broad satisfaction and broad dissatisfaction.

Figure 7: Satisfaction with the Guiding Principles

Source: Online Survey, Sept. 2008

KEY MESSAGES – on the Guiding Principles

Comments here are based on literal responses (76): **First principle: work related learning.** Fifteen respondents raised issues about the practicality of focusing on work related learning/authentic workplace practice. One respondent suggested that for example 'authentic' is not always 'ideal' workplace practice.

These concerns covered the practicality of:

- finding examples for every concept;
- geographical limitations,
- number of employers actually engaged.

Second principle: the effective use of science: this principle again raised a point made earlier, and that is the issue of wanting to see more emphasis on ensuring the development of scientific skills and knowledge (i.e. understanding principles of science, scientific method). Several of these respondents emphasise this is particularly important in a work-related learning context – i.e. to ensure learners develop a knowledge of fundamental concepts before applying this in the workplace.

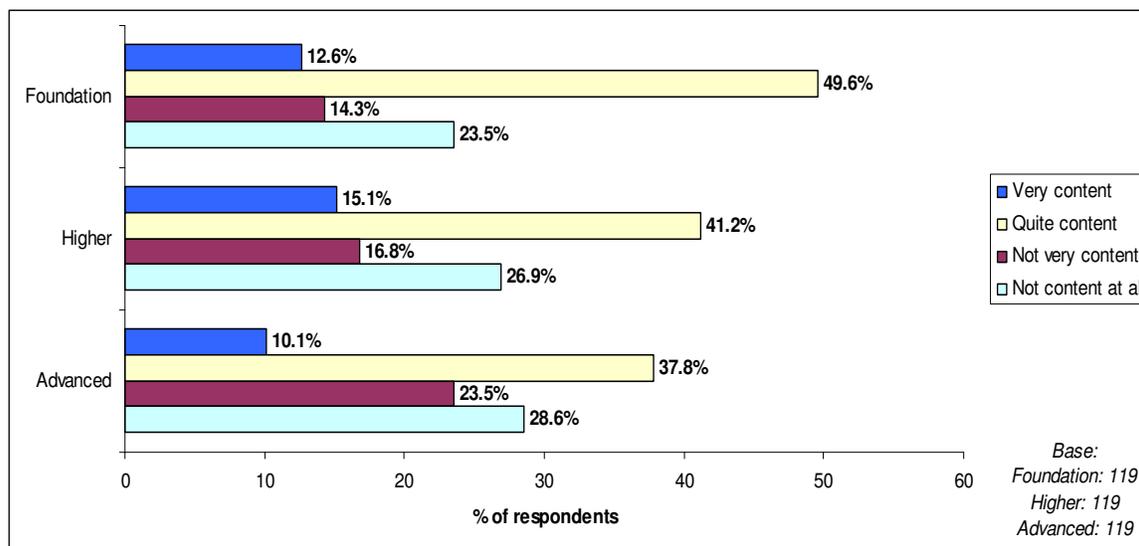
Third principle: transferability and the future: six respondents queried the inclusion of the ‘transferability/future’ principle; the comments range from – this knowledge transfer/predicting the future is difficult for this level of learner to it adds little to the overall principles, as it would be part of the first two principles.

3.4 Theme Titles

Themes are useful as a structural tool, ie they can form a means of organising the knowledge, skills and understanding that will need to be contained within the Principal Learning.

In time it might be that the themes are dropped, but this consultation presented an opportunity to further explore the concept regarding the Diploma’s vision of an interdisciplinary nature whilst retaining the specialism approach.

Figure 8: Contentment with the proposed Theme titles



Source: Online Survey, Sept. 2008

A statement in the document⁴ was included to explain to the participants in the survey that the links with these traditional disciplines of Chemistry, Physics and Biology will remain within the Diploma. The theme titles proposed were designed to incorporate not only the aims of the Diploma in Science but also build on the overarching rationale. They also attempt to engage learners of all types. They also take on board responses in the earlier consultation that indicated here is an opportunity to present a more holistic approach. This may better reflect the

⁴ This overall interdisciplinary approach will consistently enable learners to study biology, physics and chemistry at frequent key points through the Diploma in a fully contextualised manner.

interdisciplinary nature of much scientific activity as well as the point that the science industry is *'often found in the areas between disciplines.'*

KEY MESSAGES – on the theme titles

Comments here are based on literal responses (75):

Over a quarter regard the theme titles as being synonyms for the three 'traditional' disciplines of Physics, Biology and Chemistry. Some see it as a good opportunity to make it more engaging and others say it will just cause confusion.

Just under a quarter suggest the theme titles should therefore revert to the three subject areas; the others acknowledge a reference to the three disciplines but that the themes show the 'balance'/'overlaps' between them; one suggests that by remaining within boundaries of the three disciplines, the themes risk an under-representation of 'new science' such as informatics.

8 respondents suggest adding maths as a theme in its own right; a further **9 respondents** regard maths as missing from the themes.

Of the three theme titles, the **Material theme** received the most comments: **2 respondents** suggest that it may be better to use 'chemical' theme, with a third not offering an alternative title but suggesting chemistry includes for example processes and energy also.

Finally, a number of respondents pointed to the need for inclusion of **psychology**. One respondent explained that this was partly because 'the QCA now class psychology under the science umbrella'.

3.5 The Theme Diagram

The Venn diagram approach to illustrate and convey the interdisciplinary nature has been on the whole well received. The three workshops, where the topics were discussed in more detail, confirmed that the diagrams help to show the relationship between subject content and potential for the areas that overlap. The approach also promoted further questions about the learner covering all of the items included in the Venn diagrams. This caused some major concern as to how feasible this was given that some topics could potentially be the same size as a degree course.

Block diagrams showing the structure and potential for flexibility and the design of personalised learning programmes was presented to the Steering Group on 30 July. The diagram for the Advanced level Diploma was discussed with participants in the three workshops. The discussions covered how, for example, the required 540

guided learning hours for principal learning at Advanced Level, equating roughly to 1½ GCE A levels, might be divided up into 9 topics. When reviewing those 9 topics the three workshop participants could see the potential for inclusion for key aspects of each of the 3 disciplines across several 90 glh, and for exploring some established and emerging disciplines that cut across traditional subject boundaries. Possibilities for both depth and breadth, depending on a learner's interests and aspirations, were thought to arise from imaginative use of the Extended project and, possibly, work experience. Additional and specialist learning was also seen as an opportunity for either greater depth or breadth. Finally, the idea that PLTS provides an underlying curriculum rationale absent in most advanced level courses was broadly acknowledged and welcomed.

Other concerns expressed within the consultation relating to the interdisciplinary nature show that, although it is generally regarded as commendable, respondents consistently state across the questions on themes and topics that the Diploma in Science must have **depth**, particularly at Advanced level and for those planning to go onto Higher Education. One school on considering the interdisciplinary approach for instance pointed to the fact that typically at AS Level, only a very small percentage of their students do all three disciplines of Chemistry, Biology and Physics, the bulk of their students undertake one or at most maybe two subjects.

However, some participants at the workshops felt that maintaining (from Key stage 4) a breadth of science was a strength and welcome given that the Diploma structure allowed increased depth of knowledge and understanding to be acquired beyond Principal learning.

One participant from industry asked whether or not links to the Grand Challenges had been considered. It has not. However, subsequently and following further discussions, it may provide an excellent way of enhancing the vision of the Diploma and arriving at topics for the Principal learning.

3.5.1 Specialisms missing from the diagram

Given that the Venn diagram provided in the consultation document is only intended to be illustrative, respondents to the online survey were nevertheless asked whether there were any specialisms that they perceived to be missing.

There were two areas mentioned by **23 respondents** each:

- 1) Mathematics and Statistics, and
- 2) Psychology/behavioural science

For both specialisms, respondents provided further details on example areas to be considered.

| | |
|---------------------------------------|---|
| Mathematics and Statistics | Experimental data; errors and their propagation; regression analysis; basic statistics testing; calculus; mechanics; analytic geometry; complex numbers; linear algebra; mathematical physics; biomathematics; biostatistics; mathematical medicine |
| Psychology/behavioural science | Environmental psychology; consumer psychology; territorial behaviour in animals; health psychology; social psychology; sports psychology; neuropsychology – effects of drugs on behaviour; memory and cognitive processes |

Source: Online Survey, Sept. 2008

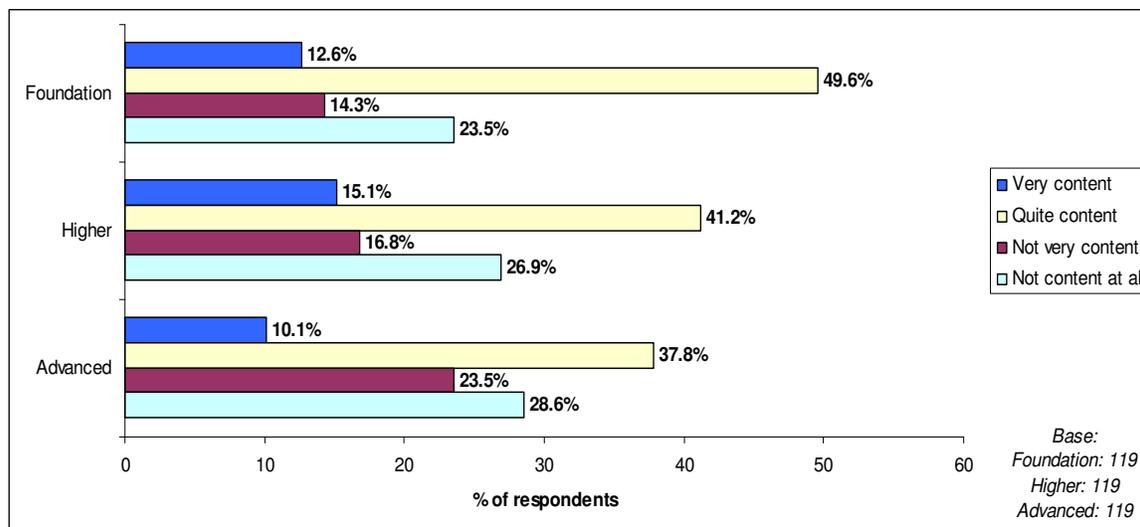
For a full list of specialisms thought by survey respondents to be missing from the Venn diagram, please see the separate Annex to this report.

3.6 Topic Titles

Within the themes at each level topics have been designed and are contained within each of the three Venn diagrams.

These topics are meant to be indicative with further detail provided in an Annex 1 for those who wished to examine the detail further.

Figure 9: Satisfaction with the Topic Titles



Source: Online Survey, Sept. 2008

As can be seen from Figure 9 the level of satisfaction with Topic titles is highest at Foundation level with a decreasing trend for Higher and Advanced Topic titles.

KEY MESSAGES – on the Topic titles

Comments here are based on literal responses (75):

13 respondents note the lack of topics dealing with mathematical content, viewing maths as being fundamental to the study of science – as one respondent described it – mathematics is the language of science.

8 respondents think that the topic titles are vague or unclear, with lack of reference to the detail in the content with half of those suggesting revising the terminology used to ensure it is clear exactly what the topic covers (as an example: - ‘Exploring size, scale and structure’ topic looks at atomic and molecular structure so a title such as ‘The structure of the universe’ is suggested).

KEY MESSAGES – on the Topic titles – per level

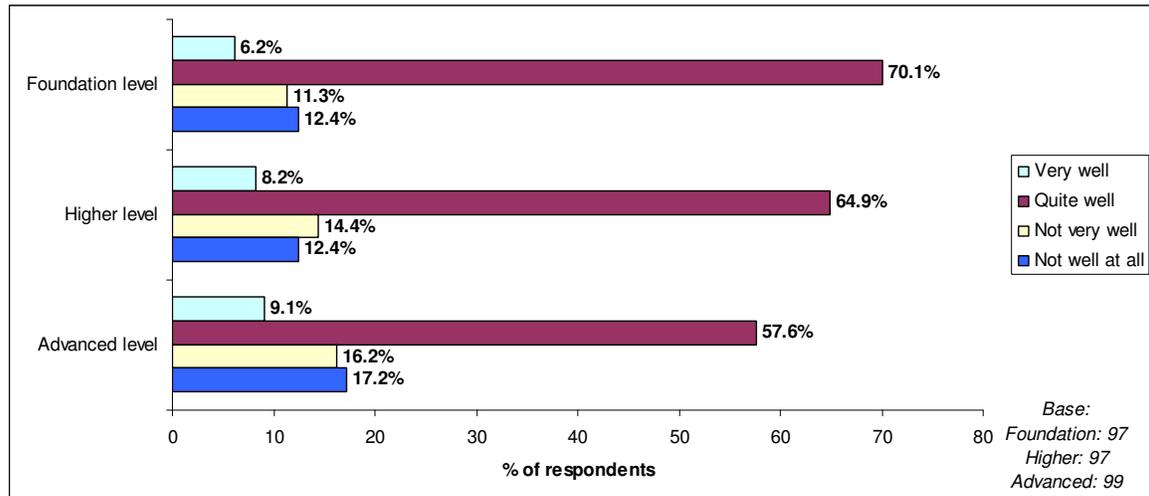
6 respondents suggest that the term ‘Exploiting resources...’ at **Foundation level** should be changed (e.g. ‘harnessing resources’, ‘managing resources’, ‘responsible development’ instead).

6 respondents perceive there to be too much breadth at Advanced level and are concerned students need to cover topics in adequate depth, for instance to prepare for Higher Education. Two of those suggest that there needs to be an element of ‘choice’ in topics at Advanced level so students can achieve this depth to their

learning.

As Figure 10 shows, respondents are most satisfied with how well the proposed topics fit with the Themes at **Foundation** and **Higher** levels.

Figure 10: How well respondents think the topics fit with the Themes



Source: Online Survey, Sept. 2008

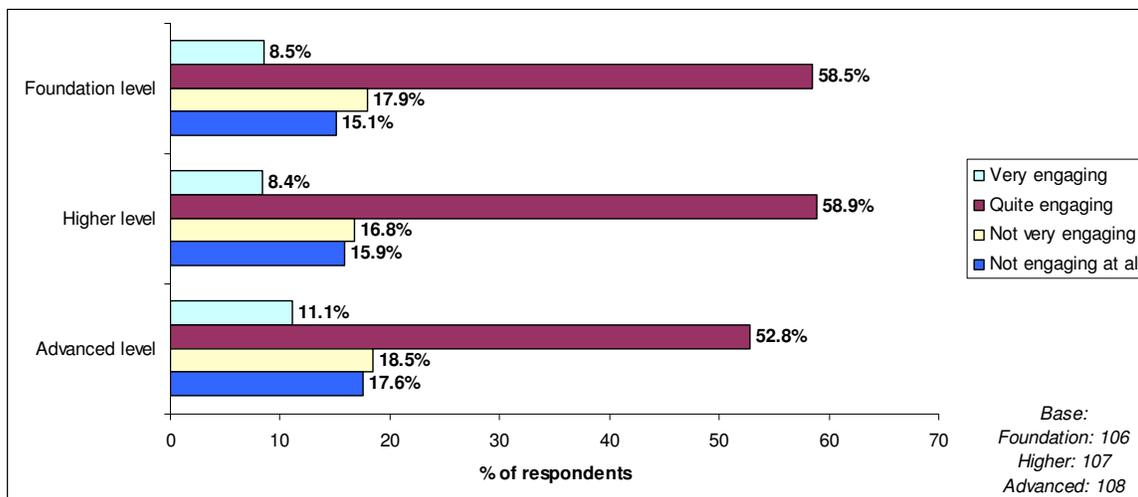
KEY MESSAGES – on the topics fitting with Themes

Comments here are based on literal responses (38): **7 respondents** note a perceived omission of psychology across the levels, with two of these suggesting that psychology topics should be included within the Living Theme.

5 respondents highlight a lack of mathematics topics within the Themes across each of the levels

4 respondents suggest that topic F1 at Foundation level (Using scientific methods safely) should be a core topic at each of the three levels

Figure 11: How engaging respondents think the proposed topic titles are for learners



Source: Online Survey, Sept. 2008

Survey respondents are slightly less positive that the proposed topic titles will be engaging for learners aged 14-19 – with levels of satisfaction again at their highest among stakeholders for the topic titles at Foundation and Higher levels.

KEY MESSAGES - engagement with learners

Comments here are based on literal responses (63):

13 respondents think that it will be more important to ensure that the way the topics are delivered by teaching staff to learners is engaging, rather than being concerned with how engaging the titles of the topics sound. This reinforces a point made at the 3 workshops about the style of teaching and learning, which workshop attendees feel is a really critical success factor for the Diploma in Science.

Nevertheless, **5 respondents** suggest that the clarity of the topic titles could be improved for an audience of learners, for example to highlight the exact content, as one respondent queried, what will a learner understand about a topic from a title such as ‘investigating substances and evidence’ (topic A2).

8 respondents suggest that the inclusion of psychology will create more engaging topics for learners (e.g. the study of behaviour, neuroscience, brain imaging, sleep, stress).

3.7 Topic Content

KEY MESSAGES – changes to proposed topics (from main document)

Comments here are based on literal responses (45):

Survey respondents were asked to review the individual venn diagrams presented in the consultation document for each of the levels of the Diploma in Science, and suggest any changes that they would like to see made to the proposed topics. It should be noted that comments from respondents are based on a review of the **topic titles at each level only**, rather than the more detailed proposed content as outlined in the Appendix 1 to the consultation document (comments on this are provided below).

As highlighted elsewhere in the consultation, the main changes respondents say they would like to see are the further inclusion of essential **mathematical content (9 respondents)** and the addition of **psychology (8 respondents)** within the topics.

For a full breakdown of changes suggested for individual topics at each level, please refer to the separate Annex provided alongside this report.

KEY MESSAGES – changes to proposed topics (from Consultation Appendix 1)

Comments on the detail in the Appendix are based on literal responses (26):

Some 26 survey respondents chose to provide additional comments on the more detailed proposed content of each of the topics as provided during the consultation in Appendix 1 to the main document.

Again, a full list of changes suggested can be found in the Annex to this report, but the key messages from this exercise are that:

6 respondents wish to see an increase in mathematical content within the topics across the three levels

4 respondents perceive psychology to be missing from the current proposed content

3 respondents suggest specific changes to **Topic A3** ‘Exploiting natural resources’ (the highest number of comments any one topic received) – two of these are concerned that this topic is underpinned by a notion of sustainability, which may not currently be apparent as it stands

3.8 Additional and Specialist Learning

Comments here are based on literal responses: Foundation (48) Higher (46) Advanced (61)

Having considered the proposed topics for the Principal Learning component of the Diploma in Science, survey respondents were asked to suggest areas that they might like to see included within Additional and Specialist Learning (ASL) at each of the three levels. A wide range of suggestions have been put forward, and are included in full in the Annex produced separately to this report.

Listed in the table below are the subjects most frequently suggested by respondents as appropriate for Additional and Specialist Learning at Foundation, Higher and Advanced level.

| | Most frequent suggestions for ASL topics |
|-------------------------|--|
| Foundation level | <p>Mathematics – e.g. geometry, algebra, sets and functions (17 respondents)</p> <p>Psychology (10 respondents)</p> <p>ICT – e.g. use of statistical software (4 respondents)</p> |
| Higher level | <p>Mathematics – e.g. differential, integral calculus (14 respondents)</p> <p>Psychology – e.g. neuropsychology, biopsychology, criminal psychology, social psychology (11 respondents)</p> <p>ICT – e.g. use of statistical software (3 respondents)</p> |
| Advanced level | <p>Mathematics – e.g. equivalent of Maths/Further Maths A level, calculus, statistics, mechanics, biomerics, interpretation of data, vectors, linear algebra, complex numbers, geometry, Mathematics for Engineering (29 respondents)</p> <p>Psychology – e.g. statistical and empirical psychology (10 respondents)</p> <p>Top up Biology, Chemistry and Physics to enable progression to HE – e.g. equivalent to A2 units (5 respondents)</p> |

Source: Online Survey, Sept. 2008

3.9 Equality of Opportunity

Since one of the aims of Diploma development is to support equality and diversity⁵, the online survey was also used to ask stakeholders to identify any issues relating to equality of opportunity for learners that they can foresee in the delivery or content of the Diploma in Science at any or each of the three levels.

For **Foundation** and **Higher** levels of the Diploma, a lack of sufficient or suitable work placements is most commonly seen by respondents as being a potential barrier for learners; at **Advanced** level respondents raise most queries regarding the potential for learners to be able to progress onto the HE courses of their choice.

Comments here are based on literal responses:
Foundation (44)
Higher (38)
Advanced (43)

| | Most common issues raised in relation to equality of opportunity |
|-------------------------|--|
| Foundation level | Lack of sufficient or suitable work placements (7 respondents) Lack of development in mathematics (5 respondents) Need for teacher training and development to be able to deliver the Diploma effectively (3 respondents) |
| Higher level | Lack of sufficient or suitable work placements (7 respondents) Physical disabilities preventing learners from engaging in some forms of practical work (2 respondents) Need for teacher training and development to be able to deliver the Diploma effectively (3 respondents) Lack of development in mathematics (2 respondents) |
| Advanced level | Lack of development in mathematics (9 respondents) Learners not being able to progress onto HE courses of their choice (7 respondents) Lack of sufficient or suitable work placements (5 respondents) |

Source: Online Survey, Sept. 2008

⁵ See: UKCES Line of Learning Statement Template August 2008, p.7 and p.15

Cross cutting conclusions - ie common points raised by a large proportion of those providing literal responses for the consultation:

Based on the online survey responses the following main points stand out :

- 1. greater emphasis required on mathematics** – the commentary on mathematics falls into three points – 1) have mathematics as its own theme, 2) mathematics is simply missing, and 3) the topics are lacking mathematics content. To a lesser degree **psychology** is also seen as missing sufficient reference in the detail.
- 2. insufficient emphasis on learners acquiring sound scientific skills and knowledge** - ie understanding the principles of science/scientific method. This is the most common comment made by those providing supplementary comments in reference to the overarching rationale and purpose statements and the guiding principles.
- 3. concern over the depth of the Diploma:** respondents feel that more needs to be done to ensure the learner is given sufficient depth that will, particularly at Advanced Level, give them the necessary grounding in the separate disciplines (and Mathematics) for progression into Higher Education study. This was perhaps less of an issue for the workshop attendees when the block diagram, mentioned earlier, was produced which shows the possible division of the 540 guided learning hours into 9 topics of 90 glh each.
- 4. difference from other provision** – there is, as yet, it appears insufficient clarity about the difference of the Diploma from other provision; this comment was made in reference to the overarching rationale and general purpose statements, and also in consideration of the purpose statements for the Foundation level.

It is also clear that the respondents are somewhat ambivalent about the theme titles; some feel there is nothing to be gained by not using the titles of chemistry, physics and biology. On the other hand others see the themes of Living, Physical and Material as being more accessible and appropriate given the interdisciplinary focus. They were not universally accepted and there is scope to reconsider these and identify newer titles that may further capture cutting edge scientific research and development taking place. A major employer suggested at the workshops that

this is a golden opportunity to reflect future drivers into scientific research and activity of scientists.

Other points raised by respondents indicated clarity will be required with regard to:

1. addressing concerns about the interdisciplinary approach and how to cater for those students who are more inclined towards one discipline than another,
2. a worry about the coverage of topics and whether a learner can cover all of them within the principal learning per level, and allied to that is the concern (listed above) that topics will not be covered by learners in sufficient depth – is depth being sacrificed in favour of breadth?
3. work experience and how this can be managed given the need for strong employer engagement, and to cater for those rural areas where there may be a scarcity of employers

4. RECOMMENDATIONS

Guidelines

- *Makes clear recommendations for changes to the proposed structure for the diploma so that the DDP can produce updated themes and topics (QD6b). If alternative structures were considered as part of the consultation, sets out which one was preferred and why.*

The main recommendations relate to overarching points made in the consultation:

1. amend the overarching statements and purpose statements to reflect the findings, covering:
 - a greater emphasis on learners' understanding of sound scientific knowledge and scientific principles,
 - make a much stronger reference to mathematics in the statements,
 - adjust references to 'appropriate', alternative (Foundation level) and quality (Higher),
2. greater explanation is required to show how the Diploma at advanced level will have sufficient depth in the three disciplines in order to provide learners with access to Higher Education,
3. consider the explicit inclusion of Mathematics or at least make it more clearer and meaningful regarding the treatment of mathematics within the Diploma including at Principal Learning and Additional and Specialist Learning.
4. consideration of the inclusion of psychology within the topics
5. theme titles need to reflect and indicate future drivers of scientific research and development which will meet the opportunity workshop (in particular) respondents pointed to, and may be a factor in engaging with learners.

Recommendations based on other points raised within the Consultation:

The current subject related knowledge presented in the consultation diagram is meant to be indicative of what may be included; however the presence of a clearer conceptual framework (as per perhaps the current programmes of study) may help to better indicate intended relationships and links between the themes and topics. This may be assisted by a tighter style of framing of the material, because, although it is an early stage of development, many ideas have been conveyed within the work to-date and it appears there are still many questions surrounding the Diploma in Science and its uniqueness.

There are perhaps also opportunities to expand within the introduction the way scientists work as this may help more fully illustrate the working practices, knowledge, understanding and skill needs of scientists and thus demonstrate how this method enables scientists to solve problems for instance.

There is a requirement to define/explain certain terms so that subsequent participants in consultations can fully understand the nature of what is being described and presented.

Following a suggestion raised during the workshops, it may be worthwhile to conduct a review of the vision and proposed topics for the Diploma in Science so that they reflect any appropriate links to Grand Challenges projects.