



NCCA

An Chomhairle Náisiúnta
Curaclaim agus Measúnachta
National Council for
Curriculum and Assessment

Report on the consultation on the draft specifications for Leaving Certificate Sciences—Biology, Chemistry and Physics

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Introduction

The Senior Cycle Review: Advisory Report (NCCA 2022a) was published in March 2022 following the response from the Minister for Education, Norma Foley, TD. Actions outlined in the Advisory Report include a review of existing curriculum components - subjects, modules, and programmes. In March 2022, the Minister for Education requested that NCCA undertake a series of actions to support the realisation of her vision for a redeveloped senior cycle as set out in [Equity and Excellence for All](#) (Department of Education, 2022.) One key action set out in this plan was that a schedule of senior cycle subjects and modules for redevelopment be prepared for approval by the Minister.

NCCA subsequently prepared a schedule of subjects for review, which was organised into a number of tranches. The redevelopment of Tranche 1 subjects will be completed in 2024 for introduction to schools in 2025. The redevelopment of the specifications for Leaving Certificate Biology, Chemistry and Physics are included in Tranche 1.

The draft Leaving Certificate Biology, Chemistry and Physics specifications were made available for national public consultation from December 8th, 2023, to February 23rd, 2024. The aim of this consultation was to seek the open and honest views of the public in relation to the curriculum and assessment arrangements in the new draft specifications for Leaving Certificate Biology, Chemistry and Physics, and to gain insights into participants' overall impressions of the specifications.

In addition to gaining insights into overall impressions, the consultation sought to explore five broad areas of focus:

- Manageability
- Specification coherence and clarity to support planning
- Introduction of the Additional Assessment Component (AAC)
- Widening the appeal of the subjects
- Supports needed for successful enactment.

The responses to the consultation indicated a generally positive perspective on the draft specifications overall, with an endorsement of the unifying strand and its ability to both support continuity from junior cycle and the development of students' investigative skills. The stated Rationale and Aims for each subject were affirmed and there was general approval for the overall structure of the learning within the strands of study. The consultation was very helpful in identifying specific instances requiring extra clarity across all three draft specifications. Concerns were expressed about the manageability of all three draft specifications. The model of the Additional Assessment Component proposed in each draft specification was broadly welcomed, however significant concerns were expressed around the manageability of the AAC in schools, in addition to the 40% weighting associated with it.

The following sections of this report will elaborate on aspects of these general findings. Section One provides an overview of the consultation process. Section Two provides reports on the feedback from the consultation and Section Three presents key considerations and conclusions.

Section 1: Consultation Process

Consultation is a key aspect of NCCA's work, where advice is shaped by feedback from the public, schools, settings, education interests and others (NCCA, 2022). The following section presents an overview of the methodological approach employed during this consultation which is underpinned by the principles set out in NCCA's Research Strategy (2023), and provides a summary of engagement during the consultation.

Methodological approach

The eleven-week consultation for the review of Leaving Certificate Biology, Chemistry and Physics included multiple modes of engagement:

- Online surveys
- Online and written submissions
- A range of school-based focus groups to capture insights from teachers, students, and school leaders
- A consultation event with individuals representing themselves or an organisation, with an interest or unique perspective on science education.

A self-selecting sampling approach was used for the online survey and written submissions. An open call invited expressions of interest from all schools to participate in a school-based component, to support gathering insights from schools, and a representative sample was selected from the 23 schools that expressed an interest in becoming involved. Ten schools were selected using criteria relating to DEIS status, gender, school size and type, in addition to expressing an interest in at least two of the three subjects. Visits to these schools took place in January and February 2024 and involved focus group meetings with 64 students of senior cycle, 30 teachers of Biology, 15 teachers of Chemistry and 8 teachers of Physics, in addition to 21 school leaders. Students aged 18 years and over consented to their participation in the consultation with parental consent and student assent sought for school visit participants under the age of 18. An open call invited expressions of interest to participate in a consultation event on the draft specifications. The event took place on February 21 and was designed to gather insights from those with an interest in and/or unique perspective on science education. A representative and purposeful sample of 96 applicants was selected to attend the event from a total of 199 applications.

A written record was made of all the discussions that took place as part of the consultation event and during schools visits. Data gathered through the consultation event and school visits was anonymised, and all data from the consultation was stored as digital files in line with NCCA's Data Protection Policy (2023). The privacy of all participants has been maintained through anonymisation, except where an organisation has given explicit permission to be identified as contributing to the consultation.

A thematic approach was used to analyse the feedback and was framed by the broad areas of focus of the consultation. This helped to identify and analyse themes within the data gathered. A summary of this analysis is presented in Section Two of this report.

Consultation responses

Online survey responses were received from 113 participants. The majority of respondents identified themselves as teachers of the subjects. 108 of the responses were from individuals, with five responses attributed to organisations. 47 online submissions were received in addition to six written submissions, across the three draft specifications.

A broad range of consultation modes, together with an eleven-week time period for consultation provided multiple opportunities for people who wished to contribute to the consultation, to do so. Information about opportunities to participate in the consultation was disseminated in several ways: via the ncca.ie website, announcements on social media platforms, messages sent via education partners to their members, and an email from the Department of Education encouraging all schools to share links to the consultation with their networks and with parents, students and teachers.

Table 1: Summary of consultation participants

Mode of consultation	Overview of participants	Numbers
Online survey	identified as a teachers of Biology, Chemistry, Physics, a parent/guardian, teacher educator, a second-level student, as a third-level student (PME and BSc with concurrent education, an organisation	113
Online submissions	individuals	31
	organisations	15
Written submissions	individuals	1
	organisations	5
School based focus groups	student focus groups	64
	teacher focus groups	53
	school leaders focus groups	21
Consultation event	round table discussions	96

Section 2: Feedback from the consultation

This section presents an overview of the feedback received during the consultation. The feedback has been grouped under the following themes:

- Overarching feedback
- Manageability
- Specification coherence and clarity to support learning
- Introduction of the Additional Assessment Component (AAC)
- Widening the appeal of the subjects
- Supports needed for successful enactment.

Other areas which were not directly consulted upon, but which were considered relevant to the development of each subject by those participating in the consultation, are also presented in this section of the report.

Overarching feedback

The majority of participants across the consultation welcomed the draft specifications for Leaving Certificate Biology, Chemistry and Physics, and in doing so often stated that the draft specifications provided continuity and progression from junior cycle with an opportunity to build upon learning in an appropriate manner. The draft specifications were also considered to be modern in nature and responsive to science in society in the 21st century.

It's great to see the specification is moving with the times (Teacher, Focus Group)

Overarching aspects of the draft specifications that were broadly welcomed included the rationale, aims, cross-cutting themes and the unifying strand. While participants acknowledged many opportunities associated with the draft specifications, challenges were also noted, particularly around the issue of manageability. The consultation yielded many suggestions by participants to overcome such challenges and to strengthen the draft specifications.

Manageability

Participants tended to feel that the draft specifications were too long and concerns were raised about achieving the learning set out within the time allocation for each subject.

180 hours to complete the specification is not achievable. Items that require rote learning rather than understanding should be the first to go (Online Survey Response)

Significant concern about the amount of content for the prescribed hours (Written Submission)

There were two main concerns relating to the manageability of the specifications reported during the consultation. The first related to the ability to cover the content related learning in the draft specifications, which was often noted as similar to the current syllabi, in addition to the development of investigative skills as outlined in the unifying strand. Participants also expressed a concern about the ability to engage with and complete the Additional Assessment Component within the 20-hour timeframe proposed in the draft specifications.

If the scope is the same and you add a 20-hour Additional Assessment Component, we won't have the time to engage with developing the investigative skills the way it is intended (Teacher, Focus Group)

The course is too long and adding on an Additional Assessment Component could be problematic. They are all good courses but Chemistry could be shorter so students can engage better (School Leader, Focus Group)

Manageability concerns associated with the amount of content related learning identified in the draft specifications were particularly evident in Biology and Chemistry. Participants across all modes of consultation suggested areas of learning for removal or refinement to address manageability concerns. During discussions participants provided supporting rationales for suggested edits. In some instances, learning suggested for removal or refinement was consistent across the consultation, for example, the suggestion to change the focus of the history of the atom in Chemistry from the historical timeline associated with the key scientists, to the development of the model only, and in Biology to reconsider the inclusion of the musculoskeletal system. However, in the majority, diverging views and rationales were offered on the removal or refinement of the learning across all three draft specifications, with no clear consensus to remove any of the learning set out in the Physics draft specification.

Specification coherence and clarity to support planning

The specification template and how it sets out learning across the strands of study, was broadly welcomed. While some participants do not support the use of a technical form of a specification which uses learning outcomes¹, others welcomed the inclusion of the 'students learn about' column and were of the view that this provides a level of specificity and scaffolds the learning outcomes identified in the 'student will be able to' column. It was noted by many participants that together, both columns support clarity of understanding of the expected learning. Some participants noted this approach provided a level of detail and clarity that was not evident in previous specifications.

Love the layout students learn about and should be able to..... more specific than the last syllabus and flexible in the right places..... very happy with it (Teacher, Focus Group)

There was strong support for the depth of treatment in relation to the scientific content included in the new NCCA draft specifications for Biology, Chemistry and Physics and the linkages provided for each learning outcome in this regard (Written Submission)

¹ [The technical form of curriculum specifications for subjects and modules in a redeveloped Senior Cycle.](#)

While responses suggest that the 'students learn about' column, in addition to the 'students will be able to' column, provide greater clarity about what is to be learned, many participants also suggested ways in which both columns could be improved across all three draft specifications.

Definitely clearer but some still need to have clarification in the different areas
(Teacher, Focus Group)

The 'students learn about' column does not always support clarity, the vagueness and clarity of junior cycle is problematic and there is a fear it continues. The 'students learn about' in general though is clear, but some learning outcomes are problematic (Teacher, Focus Group)

As noted in relation to feedback to address the manageability of the specifications, a variety of suggestions were offered throughout the consultation to bring further clarity to specific learning outcomes and the associated 'students learn about' column across the three draft specifications. These suggestions were both informative and helpful for the Development Groups in refining the draft specifications.

During discussions in the school-based focus groups and the consultation event, there were opportunities to discuss and to understand more clearly broad statements such as 'learning outcomes are vague'. During these discussions, most participants who expressed this broad concern clarified that their uncertainty related to specific learning outcomes which they highlighted for review. However, it is important to note that during these discussions, the majority of participants acknowledged that the level of detail provided in the draft specifications was either similar to or more detailed than the current syllabi. During such discussions, many participants also acknowledged the important role that additional guidelines, sample examination papers, and professional learning experiences will play in providing clarity for teachers and students. It was also acknowledged that the clarity of understanding of the current syllabi has been developed over time and that this will also happen in the context of the draft specifications.

The issue of coherence was most pointed in relation to the crosscutting themes of Health, Sustainability and Technology. These themes are common across all three draft specifications and are intended to be used as a lens through which students explore the application of learning from Biology, Chemistry and Physics. Many participants understood the necessity to connect with ongoing real-life developments in science, however, there appears to be a degree of uncertainty as to how to effectively engage with the crosscutting themes. Participants would welcome further guidance and examples on how to effectively integrate the crosscutting themes into ongoing teaching and learning, without them becoming a 'box-ticking' exercise.

Introduction of the Additional Assessment Component (AAC)

An assessment component, other than a written examination, that assesses the learning about science set out in the unifying strand through research and experimental investigation was welcomed. Many participants acknowledged the range of opportunities associated with the proposed Additional Assessment Component, with students in particular welcoming the reduction in stress that the AAC could bring.

Would be absolutely fabulous in terms of practical skills, especially science students who want to go on to 3rd level. The research and investigative approach – skills in research, analysing data, writing up a conclusion, writing up a report, apply massively for 3rd level and for general life as well (Teacher, Focus Group)

However, in general, participants across all modes of the consultation identified more challenges than opportunities in relation to the model of the AAC, as set out in the draft specifications. The two-stage design of the component was welcomed and perceived as a genuine effort to ameliorate some of the challenges identified.

The broad thematic overview is welcome, but you still have to stop the learning to do this task (Teacher, Focus Group)

The AAC model proposed in the draft specifications set out to reduce the assessment load through assessing learning outcomes from the unifying strand, which is experienced as part of students' everyday science learning and allocating up to 20 hours of class time for engaging with and completing the AAC. Feedback from the consultation suggests that the proposed model of the AAC would have the opposite effect on both fronts, that is, the Biology, Chemistry and Physics in Practice Investigations would not be integrated into everyday teaching and learning and would not be time bound to 20 hours. The feedback suggests that it is perceived that this will become an 'event' in sixth year that requires teachers to halt teaching and learning for a prolonged period of time, leading to increased stress and workload for students and teachers. There was also a concern noted that this would result in a reluctance by students to pick more than one Leaving Certificate science subject.

The balance of experiment and research work, all lovely but the reality is time (Teacher, Focus Group)

The AAC needs to be a balanced, integral part of the course and not grafted on as it seems to be on the current draft. It should be highly valued in terms of the skills and output expected and not only in terms of the time needed. This needs to be crystal clear in how it is communicated (Teacher, Focus Group)

While the majority of students welcomed the AAC citing reasons such as taking the pressure off the final exam and supporting their learning within the subject, concerns were also expressed by some participants about the potential of spreading the stress over a longer period of time, as well as concerns about equity.

I would like an assessment that doesn't make me do something extra, it's just part of what I learn in class. It needs to be efficient (Student, Focus Group)

The AAC would give some people an unfair advantage. Having to do it in class would help with this (Student, Focus Group)

It was noted across the consultation that there are concerns that schools are currently not resourced sufficiently to implement the AAC as detailed. Equipment shortages and pressure for

laboratory space were noted as issues of concern from teachers in particular. There was strong support from participants on the process of the AAC being valued and assessed over the final product, with equity between schools expressed as a core issue. There is an acceptance that sixth year is the most appropriate time for completing what is set out in the draft specifications, however, all participants including students, fear that there will be overlaps and log jams of deadlines in an already stressful period.

Whilst concerns and suggestions were raised about the design and parameters of the AAC, some participants also recognised the need for a change in culture and mindset to facilitate integration of an AAC within existing practices in Leaving Certificate science classrooms:

The approach to developing independent investigators has to happen from first year onwards... how to get it to work in the sciences, that's the challenge. It works successfully in other subjects, it's embedded as part of the culture. CPD is going to be critical, show how an integrated approach to learning in practice can work. We also need to change a culture and a mindset. What is presented in the specifications calls for a huge change in culture (School Leader, Focus Group)

Widening the appeal of the subjects

Feedback from the consultation recognises the need to widen the appeal of the physical sciences, whilst maintaining the appeal of Leaving Certificate Biology. Improving the appeal of Chemistry and Physics was almost universally interpreted as increasing the numbers of students taking the subjects and most participants thought the draft specifications would not improve the appeal of either Chemistry or Physics in that regard. It was noted that the draft specifications would likely attract the same cohort of students and that developing a more accessible ordinary level pathway through each subject could potentially support a more diverse cohort of students to take each subject, thus widening the appeal. Participants noted that Biology in general attracted a diverse cohort of students, which is evident in the numbers of students taking both higher and ordinary level in the subject.

Most kids who pick Chemistry and Physics are only thinking of higher level – they don't think of it in terms of ordinary level. Need something for the ordinary level student in the subject (School Leader, Focus Group)

Ordinary level Chemistry always hear you don't need to know how this happens. It's always what I don't need to know rather than what I do need to know (Student, Focus Group)

When widening the appeal of the subjects was discussed from the perspective of improving the experience for students, reference was made to the opportunities that the cross-cutting themes could provide in connecting science to society and connecting students' knowledge and understanding of a particular concept or process to its real-world application. Student perspectives from the consultation feedback indicated they could link learning in both Biology and Physics to an associated real-world application more clearly than was evident in Chemistry.

In discussions with teachers and school leaders, the Additional Assessment Component was considered likely to widen the appeal of the subject for a wider cohort of students, supporting them to make tangible links to their interests and context.

Project based component will positively encourage uptake (Teacher, Focus Group)

However, there was a concern that the model of the Additional Assessment Component proposed in the draft specifications would make students reluctant to choose more than one science subject, and teachers in particular were concerned about the negative impact this would have on widening the appeal of the subjects.

Supports needed for successful enactment

The conditions needed to support effective implementation of the three subjects were highlighted in contributions from across all of the modes of engagement and in particular from teachers and school leaders. Many participants raised questions about resources and supports needed to enable the successful enactment of the draft specifications in Biology, Chemistry and Physics. Teacher professional development was recognised as a key enabler to successful implementation, with the majority of participants highlighting face-to-face support as a preferable option over online, for core professional learning days. Suggestions for effective professional development were provided by many of the participants, with opportunities to engage with colleagues through professional learning networks, considered particularly important.

The learning outcomes approach relies on teachers having the confidence, subject content knowledge and pedagogical knowledge to teach this specification in the manner in which it is intended. This is not to suggest that this approach should be altered, quite the contrary, it is arguably the best approach for student learning. However, teachers do not have enough experience of it and cannot be expected to change overnight to this way of preparing lessons. It requires sustained professional development by experts in the field of curriculum making (Online Submission)

Guidance documents to support the implementation of the draft specifications were also noted as important enablers of successful enactment by participants, as were sample examination papers, assessment briefs and guidelines to support the AAC, published at the same time as the final specifications.

I think it would also be important to provide plenty of support for the AAC such as examples of different levels of student work, and sample questions and solutions for future written exams (Online Survey Response)

Don't want to start teaching the course in 2025 and not seeing a sample paper until 2026 (Teacher, Focus Group)

Additional pressures were also noted by school leaders in hiring and retaining suitably qualified teachers in both Chemistry and Physics. Professional time, as was provided during junior cycle implementation, was noted as being a necessary support, in addition to funding for resources. A

desire for laboratory technicians was particularly evident from participants responding to the draft Chemistry specification, as a necessary support for successful enactment.

Technicians and support in the lab is needed if AAC is to be successful (Teacher, Focus Group)

Securing resources for the redeveloped physical science subjects is absolutely essential - not least because of the 40% of marks allocated to the additional assessment component (Written Submission)

Other areas of feedback

Modelling

Divergent views on the approach to modelling, as outlined in the draft specifications, were noted in the consultation feedback. Many participants welcomed and supported the use of modelling within the specifications.

Models are central to scientific thought; an appreciation of the development and use of models is essential to understanding how knowledge in chemistry is produced. They are constructed to make sense of empirical findings and are continually used to make predictions and devise hypotheses for testing. Therefore, we are pleased to see modelling referred to in both U1 and U2 (Online Submission)

The model approach, interpreting data, figuring things out themselves is important (Teacher, Focus Group)

While other participants felt that the use of the verb model was not appropriate, and that more clarity was needed when model was used in learning outcomes.

The use of the verb "model" in the Physics and Chemistry specifications caused particular difficulty (Written Submission)

All learning outcomes containing the word model when used as a verb should be replaced by action verbs whose meanings are clearly defined in standard English dictionaries (Written Submission)

The approach to investigative work

Divergent views on how investigative work, particularly in how experimental investigative work is framed in the draft specifications, were noted. Some participants welcomed the flexibility afforded to the approach adopted in the draft specifications and the move away from prescriptive investigations, with an acknowledgement of the role of the unifying strand as a supportive framework in developing investigative skills among students through the draft specifications.

The investigative approach taken in each of the draft specifications was to be welcomed from a number of different perspectives, such as, the student-working-as-a-mini-scientist, developing investigative skills, thinking skills, sceptical skills, creativity and critical thinking and scaffolding students' formative assessment
(Online Submission)

The approach to experimental work is helped by the unifying strand, Nature of Science (Teacher, Focus Group)

However, there were also many participants who did not support this approach and requested a list of prescribed mandatory experiments. In addition, further clarity was sought on terms such as primary and secondary data.

There is a lack of clarity in the laboratory practical investigations that are mandatory in order to achieve the appropriate learning outcomes (Written Submission)

There is a lack of clarity regarding the laboratory practical investigations required in order to achieve the appropriate learning outcomes for the three subjects. A list of mandatory student investigations was not included in any of the three specifications. It is recommended that this list is drawn up by each NCCA development group to bring clarity to what laboratory practical work is needed in order to successfully implement the specification in the classroom. This clarification is essential in helping teachers securing resources for the correct equipment of their laboratory (Written Submission)

Views expressed by students during the consultation would indicate that they learn best when they engage with practical investigations and enjoy learning through these experiences. The connection between investigations and the development of concepts within the draft specifications, while connecting to real world applications, were considered important in supporting understanding for students.

Make sure the experiments are connected better to the theory. Experiments make the learning connect to real life or to the theory. Please don't do repetitive experiments (Student, Focus Group)

Section 3: Considerations and conclusion

Considerations

Overall, the draft specifications for Leaving Certificate Biology, Chemistry and Physics were well received and the consultation fulfilled its objective of initiating discussion and debate on key aspects of the design of the draft specifications. The consultation yielded a considerable amount of feedback that has provided direction and guidance for the Development Groups to refine and strengthen the draft specifications for publication.

Issues raised for consideration in this context include:

- How to address the manageability concerns within each draft specification.
- The need to further develop clarity within the learning identified in each draft specification.
- How to address the concerns noted on the proposed model of the Additional Assessment Component (AAC). Development Groups will need to consider how to consolidate the aspects of the model that were viewed as supporting the rationale and aims of the draft specifications, while amending the model to support the integration of the AAC into regular teaching and learning and to address perceptions related to manageability of the AAC expressed during the consultation.
- The request to ensure there are purposeful and coherent ordinary level pathways through each specification.
- The types of supports needed to ensure the successful enactment of the specifications, which include supporting guidance documents.

Feedback gathered during this public consultation highlighted a number of issues that are broader systemic considerations related to senior cycle redevelopment. These included significant concern for student wellbeing and potential levels of stress and pressure through the introduction of AACs in all subjects as part of senior cycle redevelopment, coupled with widespread concerns about access to resources in schools when students are completing their AAC.

In terms of implementation, provision of timely supports was a strong overarching theme in the consultation with a request for timely and equitable access to effective CPD supports which should be face-to-face and address the needs of the teachers in understanding what they need to know about senior cycle redevelopment and the redevelopment of specific subjects.

Conclusion

The consultation on the draft specifications for Leaving Certificate Biology, Chemistry and Physics generated rich discussion and led to useful and thoughtful feedback from multiple perspectives, leading to a very informative process. The engagement of those who participated in the consultation is acknowledged and NCCA is grateful for the open, honest, committed, experience-based and expert feedback received.

Notwithstanding some criticism, the consultation findings indicate that there is support for the introduction of the redeveloped specifications for Leaving Certificate Biology, Chemistry and Physics. Consultation feedback indicates there are positive views on the draft specifications, while acknowledging the need for a reduction in content and the addition of greater clarity in some areas of each draft specification, along with the provision of professional learning, supports and resources which are fundamental to successful implementation. Consultation feedback also indicates there are wide-ranging concerns regarding the manageability of the model proposed within the Additional Assessment Component.

The high level of teacher input to the consultation is gratefully acknowledged and the positive response from teachers indicates a sense of optimism about the opportunity to revitalise the subjects, given that they have not undergone any meaningful changes in several decades.

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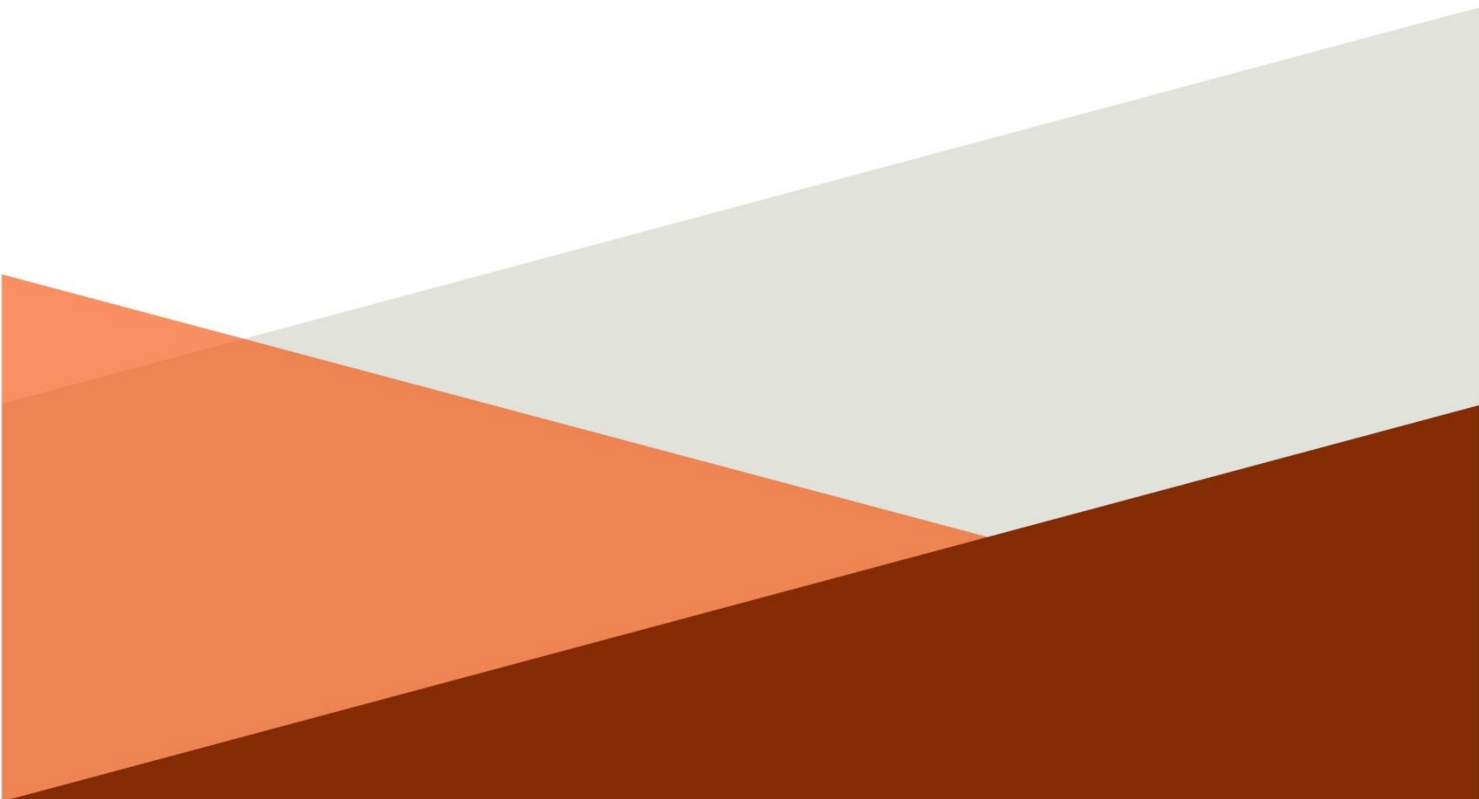
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Appendix One: List of Contributors

The following is a list of individuals and/or organisations who responded to the consultation, that wished to be listed in this report.

AMBER Centre
Association of Secondary Teachers in Ireland
Biology Education Special Interest Group ESAI
CERN Ireland users group and particle physicists at UCD, TCD and DIAS
Circular Bioeconomy Research Group, Munster Technological University
College of Science, Engineering and Food Science at University College Cork
Department of Agriculture, Food and the Marine
Discipline of Food Science and Industrial Biotechnology, TU Dublin
Dominican College, Griffith Avenue, Drumcondra, D9
Dr John O'Donoghue RSC Education Coordinator, Trinity College Dublin
EPI*STEM National Centre for STEM Education, School of Education, University of Limerick
Ireland's Knowledge Centre for Carbon Climate and Community, Munster Technological University
Irish Science Teachers' Association
Irish Universities Association
Maynooth University PME Chemistry Student Teachers
Royal Society of Chemistry
Royal Society of Chemistry Food Group
Science Department at Laurel Hill FCJ
The Institute of Physics
Trinity College Dublin Chem Ed Group
Teachers Union of Ireland



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