

ESB Science Blast Programme Evaluation

June 2024

Quality Matters
supporting improvement in social services

Executive Summary

Introduction

ESB Science Blast is a non-competitive primary school science programme that involves the whole class investigating the science behind a simple question and then showcasing their work. Established in 2010 as the RDS Primary Science Fair, it became its own distinct initiative in 2019 and has been running ESB Science Blast events since 2019 in Belfast, Dublin, and Limerick (with some breaks for Covid). In 2024 there were 673 projects from 412 schools reaching approximately 16,825 children in Ireland. Counties with the highest participation rates include Dublin, Limerick, Louth, Meath and Wicklow. Counties with the lowest participation rates include Antrim, Armagh, Down, Fermanagh and Tyrone.

In November 2023, the RDS Foundation contracted Quality Matters to independently evaluate the impact of the ESB Science Blast Programme to inform its future development and expansion. The evaluation sought to situate the programme in context, understand the impact it was having on students and teachers at primary level across a range of different contexts, identify barriers to participation and identify recommendations for future development of the programme. The learning from this evaluation is intended to support the RDS Foundation in developing a strategy for expansion of ESB Science Blast. The findings and recommendations in this evaluation are based on interviews with eight key informants from across government, industry and education, survey responses from 177 teachers and 693 children (consulted directly for the first time), interviews with teachers and children at the RDS showcase event, 12 interviews with teachers and principals from non-participating schools and two interviews with virtual participants.

Programme Context

Science, technology, engineering and mathematics (STEM) education in Ireland has been recognised as crucial not only for Ireland's economic prosperity given the growing demand for workers with STEM skills, but also to support young people to become active citizens, to engage with modern communications and media in a critical way, to support their own personal well-being and to make informed choices about many aspects of their lives. Significant developments in STEM education in the past 10 years include:

- a STEM Education Policy Statement 2017-2026 setting out a long-term vision
- a new STEM learning grant scheme providing STEM grants to schools
- changes to the primary and post-primary curricula focusing on skills needed for the 21st century
- increasing STEM initiatives in schools
- expanded and more consolidated teacher training in STEM.

The new primary school science curriculum, expected to be rolled out to schools in 2025, presents an important opportunity for partnership and coordination to ensure that all children can avail of quality STEM experiences. ESB Science Blast closely aligns with the new draft primary school science curriculum,

which has a strong emphasis on scientific inquiry. Its implementation presents an important opportunity for ESB Science Blast to become embedded as a core STEM experience within primary schools. Similarly, the upcoming review of 'The World Around Us' in the Northern Ireland Curriculum in 2025 presents an opportunity for strengthening curricular links.

Strengths and Areas for Improvement

Children and teachers gave their views on strengths of the programme and areas for improvement through surveys and interviews. The most valued elements of the programme for children were attending the RDS showcase, showing off their work to others, talking to a scientist about their work and carrying out the investigation themselves. The most valued elements of the programme for teachers were letting the children carry out the investigation, letting the children decide what was investigated and coming to the showcase event. Children and teachers described in their own words the best parts of ESB Science Blast, which included the showcase itself (particularly the shows and stalls, the ability to explore independently, showcasing their work and learning about other schools' projects), the fun the children had while doing the project, and the opportunity to learn about science and develop key skills. Teachers also highlighted the importance of the child-led inquiry-based learning model, the curiosity and interest it generates in STEM among children, and how it supports them with integrated teaching and learning. The dedicated day for Gaelscoileanna was appreciated by both children and teachers.

Suggestions for improvement from children and teachers included more interactive activities, stands and shows, more adaptations to avoid sensory overload, lower cost and more diverse food options, more consistency in the timing and quality of feedback from judges, more teacher learning opportunities, more support for travel costs and more time to do the investigations. Suggestions were also made for the virtual programme.

Children and teachers gave suggestions for ways to sustain the excitement generated by ESB Blast which included actions for teachers and schools, policy makers and funders, as well as the RDS. These included more hands-on experiments/interactive learning and projects, more repeat participation at ESB Science Blast, more technology, coding, design and robotics in the classroom, more resources to support investigations in school and more support for teachers. Teachers highlighted what resources would help them get the most out of ESB Science Blast, which included lesson plans, webinars and other online resources, particularly guidance on how to approach an investigation, support in building STEM skills in specific areas, examples of previous projects, inquiry-based learning guidance and case studies, more orientation on the showcase event, webinars for children and Irish language resources. Teachers also made several additional suggestions, including requests for support with science equipment and travel.

The perspectives of key informants on the value of ESB Science Blast mirrors the findings from children and teachers. They highlighted how ESB Science Blast supports children to build key skills, supports teachers to teach in an integrated way and provides recognition and acknowledgement to both

teachers and students in a non-competitive way. They highlighted how it is inclusive, particularly through its dedicated day for Gaelscoileanna, how it promotes children's participation and children's voices, and how the showcase events have an energy and buzz creating enthusiasm for science in early childhood.

Outcomes for Children, Teachers and Schools

Children and teachers reported on outcomes for children following the project. Most children reported increased confidence in the following areas:

- ✓ Working as a team (71%)
- ✓ Preparedness to attend a big event like the RDS showcase (66%)
- ✓ Carrying out an investigation and putting results together (64%)
- ✓ Giving their opinion in class (58%)
- ✓ Solving problems (54%)
- ✓ Presenting to and answering questions from an adult they didn't know (53%)

Children also reported:

- ✓ Increased interest in working in a STEM job in future (65%)
- ✓ Increased interest in studying STEM subjects (65%)

Most teachers reported changes for children in the following areas:

- ✓ Actively engaging in their own learning (94%)
- ✓ Enthusiasm and excitement about science (93%)
- ✓ Working as a team (93%)
- ✓ Pursuing an area of interest to them (88%)
- ✓ Presentation skills (86%)
- ✓ Listening to their classmates (86%)
- ✓ Ability to respond to an adult's questions (85%)
- ✓ Applying STEM to real life situations (81%)
- ✓ Identifying their own strengths, both academic and non-academic (81%)

Most teachers reported increased ability to support their class to develop the following STEM skills:

- ✓ Presenting their findings and respond to questions (91%)
- ✓ Developing a science question or hypothesis (88%)
- ✓ Integrating with other subject areas in the curriculum (87%)
- ✓ Seeing the real life application of STEM (86%)
- ✓ Explaining basic science principles (84%)
- ✓ Testing a question / hypothesis (79%)

Most teachers reported:

- ✓ Increased skills and confidence to teach in an integrated way (62-64%)

- ✓ Increased skills and confidence to teach STEM (67 – 64%)
- ✓ Increased skills and confidence in inquiry-based learning (68 – 71%)

Most teachers also reported impact for schools:

- ✓ Supports them to showcase children's learning to the school community (84%)
- ✓ Provides excitement and enthusiasm for STEM among other classes (76%)
- ✓ Provides ideas and inspiration for non-participating teachers (63%)

Children's responses regarding confidence in key skills were disaggregated by gender and by school class to investigate gender and age differences in each skill.

- No significant gender differences were found in any of the named skills between girls and boys.
- However, the small sample of non-binary children were much less likely to report increased confidence in several areas.
- No significant differences were found in relation to giving their opinion, working as a team, or solving problems.
- However, some differences were notable between age groups when it came to presenting to and answering questions from an adult they don't know, and asking questions they don't have the answers to, suggesting greater impact on older children.

Children's responses were also disaggregated by parents' background (whether born in Ireland or abroad or both) and by parental STEM career to assess any differences.

- The only significant difference by parental background was that children from immigrant families were less likely to report greater confidence in presenting to and answering questions from an adult they don't know as compared to children from families with Irish-born parents.
- Children with parents working in a STEM field were more likely to report greater confidence across all key skills following participation in ESB Science Blast.
- The biggest differences were notable in teamwork, asking questions that they don't have the answers to, and problem-solving.

Children's responses in relation to STEM career and study aspirations were also disaggregated by gender, school class, school type, parental birthplace, parental career in STEM and children's perceptions of how much science they studied in school to assess differences.

- No significant gender differences were found in interest in a STEM career.
- However, children from girls-only schools were most likely to say that ESB Science Blast made them a lot more interested in a STEM job.
- Children from 4th class were most likely to report more interest in a STEM career after participating in ESB Science Blast.
- Children with parents working in a STEM field and children who perceived that they studied a lot of science in school were much more likely to report more interest in a STEM job following participation in ESB Science Blast.

- Girls were more likely than boys to report being a bit or a lot interested in studying science or technology at secondary school.
- Children from third class were most likely to report being very interested in future STEM study and children from fourth class were most likely to report being a bit interested in future STEM study.
- Children who perceived that they did a lot of science in school were most likely to report being very interested in studying science and technology in secondary school and least likely to report no future interest in science.

Barriers to Participation

Insights on barriers to participation in ESB Science Blast were received via survey responses from 171 teachers participating in ESB Science Blast, and interviews with seven teachers and five principals from non-participating schools across Donegal, Dublin, Galway, Kerry, Laois, Leitrim, Mayo and Meath and two teachers from schools participating virtually in Cork and Westmeath. The biggest barriers to participation in ESB Science Blast highlighted by participating teachers were teachers' lack of confidence with science (53%), not enough time in the school year (51%), the cost of travel (40%), and teachers' lack of confidence with inquiry-based learning (37%). Barriers highlighted by non-participating schools or those participating virtually were the location of showcase events, travel costs, awareness of ESB Science Blast and what it involved, lack of time, participation in alternative STEM initiatives, initiative overload, lack of staffing, discomfort with science and inquiry-based learning, challenges in covering 'the basics' and concerns about how their class would manage at the showcase event. Several teachers highlighted that resources could help to incentivise participation, and offered views on alternative events, which were smaller, group based and competitive in nature.

Conclusion and Recommendations

This evaluation came at an important time of opportunity to consolidate and strengthen efforts to ensure every child in Ireland benefits from quality STEM education in primary school. Insights from children and teachers participating in the Dublin showcase event, which for the first time captured the voices of children themselves, highlighted how ESB Science Blast has been a remarkable and unique experience for children and teachers, inspiring curiosity and supporting children with key skills.

Recommendations emerged from consultations with key informants, children, teachers and principals about how to maximise the impact of ESB Science Blast and how it might be expanded in future. These were discussed and refined with the RDS Foundation team. Recommendations to strengthen programme implementation include prioritising additional staffing, maintaining the current timing of the Dublin showcase, increasing the range of interactive activities and stands at the event, making greater adaptations to make the showcase autism-friendly, maintaining high levels of staffing at the showcase, reviewing food provision at the showcase, improving the timing and quality of judges' feedback, expanding the role of judges in promoting ESB Science Blast, promoting low-cost options for class investigations, providing and marketing resources and learning opportunities for teachers, encouraging school-based initiatives following the event, and reviewing bus subsidies to encourage more equitable

participation. It is also recommended that the programme is ambitious in its vision for expansion given its alignment to the revised STEM curriculum. Every child in Ireland should be able to participate in ESB Science Blast as part of their STEM education journey. Recommendations include expansion to additional locations, convening key partners in STEM education ahead of the roll out of the revised curriculum, a more targeted strategy for expansion in Northern Ireland, expansion of continued professional development in inquiry-based learning, and additional marketing of the programme to schools.

Contents

Executive Summary 2

Acronyms 9

1 Introduction 10

2 Methodology 15

3 ESB Science Blast Programme Context 21

4 Key Findings 28

5 Outcomes 58

6 Barriers to Participation in ESB Science Blast 71

7 Draft Recommendations 80

Acronyms

AI	Artificial Intelligence
CPD	Continued Professional Development
DCU	Dublin City University
DEIS	Delivering Equality of Opportunity in Schools
DoE	Department of Education
ESB	Electricity Supply Board
P.E.	Physical Education
PSF	Primary Science Fair
RDS	Royal Dublin Society
SFI	Science Foundation Ireland
STEM	Science, Technology, Engineering and Maths
TOC	Theory of Change

1 Introduction

The past 10 years have seen huge shifts in the landscape for STEM education in Irish schools: new policy and funding initiatives in the sector, changes to primary and post-primary curricula focusing on skills needed for the 21st century, consolidation of teacher training supports, along with a plethora of STEM initiatives for schools to engage in at their discretion. In this context, and to inform its strategy for the development and expansion of the ESB Science Blast programme, the RDS Foundation sought to evaluate the programme, understand barriers to participation, and develop recommendations to maximise its impact and future sustainability.

1.1 Background and Evolution of Programme

ESB Science Blast is a non-competitive primary school science programme that involves the whole class investigating the science behind a simple question and then showcasing their work. Established in 2010 as the RDS Primary Science Fair (PSF), linked to the BT Young Scientist Project, it rebranded to ESB Science Blast in 2019. It has been running annually in Belfast, Dublin and Limerick with short breaks in 2021 – 2022 due to Covid where showcases were replaced with either classroom visits or online discussions between judges and participating classes.

The objectives of the programme are:

1. To become the dominant primary science education event in Ireland.
2. To ensure a generation of Irish children are engaged in STEM, build confidence in STEM and develop critical skills.
3. To deliver ESB Science Blast to one quarter of primary schools by 2025.

The programme is funded by the RDS Foundation, ESB, Department of Education, An Foras Patrúnachta, Bristol Myers Squibb, COGG, Department of Agriculture Food and the Marine, Foras na Gaeilge, Irish Aid, Irish American Partnership, Jones Engineering, Kainos, Kinia, Met Eireann and Teagasc. Its budget of €1.4 million (inc. VAT) covers staffing costs, costs of showcase events, including external event management support, a CPD course for teachers and a €150/ £150 subsidy for participating schools to support the costs of their travel to a showcase day. The programme has two full-time staff: the science and technology programme manager, and the school liaison officer. ESB also invests in raising public awareness of ESB Science Blast beyond primary school stakeholders and has conducted research on awareness levels among different age groups.

ESB Science Blast is the flagship programme of the RDS Foundation. The revised strategy for the RDS Foundation recognises that, as our world continues to rapidly evolve and face new challenges, it is increasingly clear that we must take proactive steps to future-proof Ireland and ensure long-term sustainability. This is especially true in Ireland and for the RDS where we want to ensure our relevance in 2031 for our tercentenary. As a charity that has traditionally focused on arts and culture, agriculture, industry and science, the RDS recognizes the need to expand our scope to address these new

challenges. As a result, the RDS Foundation will look at overarching themes in the areas of "future-proofing Ireland" and "finding common ground", across all aspects of our work. 'Future proofing Ireland' involves facilitating engagement in the scientific method and promoting life skills development, as well as encouraging participation in the arts and culture sector beyond the traditional curriculum. EBS Science Blast ensures that the RDS Foundation is delivering on this mission. The RDS Foundation is committed to using expertise and resources to make a positive impact in these areas, and bringing people together to create a more sustainable and prosperous future.

1.2 Key Stages of the Programme

The programme involves the following stages:

1.2.1 Recruitment and induction of schools and judges

The programme is advertised directly to schools via email. Schools are invited to participate in the programme through an online registration form which they complete by mid-December of the school year.

Participating schools are directed to key materials to support their participation in the programme which are available on the website.

At the same time, judges are recruited to volunteer in the programme via ESB, RDS, Science Foundation Ireland research centres, other programme sponsors and supporters, and university STEM departments. Judges can be anyone with a STEM background, STEM teachers, industry professionals or third level students. They are matched with a class (or multiple classes) in advance and meet with the class twice on the day – first to learn about the project and ask any questions, and second to give feedback to the class. They are given a 20-minute briefing on the day about the process and how to give feedback to the class, along with feedback forms.

1.2.2 Support for teachers

Several tools have been developed to support teachers and students through the process:

1. Lesson Plans for teachers: these provide a template for teachers to guide them through the steps of generating and managing science investigations in the classroom, using a six-step investigative framework.
2. Examples of previous investigations: teachers are provided with links to previous investigations to support them to provide their class with ideas and inspiration.
3. Videos with top tips for your investigation: a series of videos guide teachers through common techniques used by scientists to help the class with their investigation: better measurement, fair tests and testing humans.

ESB Science Blast TV episodes are also signposted to teachers to support them to educate, entertain, and inspire the class on topics such as defying gravity, earth power, science of the future and changes in energy.

While there is no dedicated training for teachers, the RDS runs a CPD course on inquiry-based learning every July which usually attracts approximately 25 teachers.

1.2.3 Showcase events in Belfast, Dublin and Limerick or virtual option

Showcase events take place over several days in Belfast, Dublin, and Limerick. These are open to primary school students, teachers, and parents (if they wish) to attend. Each class gets a schedule with times for arrival and departure, participation at their project stand, participation at different shows and times to explore the exhibitor area and to learn about other class projects. The exhibitor area provides engaging, interactive, STEM-focused stands from sponsors and relevant stakeholder organisations for the pupils to enjoy during the day. This area usually represents a multitude of STEM sectors and a mixture of themes, such as sustainability, biodiversity, climate, space, engineering, agriculture, transport, energy, etc. so there is something of interest for every pupil in attendance. The themes at the showcase events align with the Sustainable Development Goals (SDGs) and through exhibitor stands offer the opportunity for students to learn about how science and technology have a key role in delivering the SDGs. Classes share the findings from their investigation and their learnings along the way with an assigned STEM expert or 'judge' who offers positive feedback on their project. The judge also provides one-to-one feedback to teachers on the projects with constructive suggestions.

Schools have the option to participate remotely if they wish. They undergo the same investigation process as other classes but rather than attending a showcase event, they arrange a virtual meeting with their assigned 'judge' to present their findings and hear feedback on their project.

1.3 Programme Scale and Reach

Approximately 16,000 primary school children participate in the programme annually. In 2024, there were 16,825 children[1] involved in 673 projects from 412 schools (of which 19% are Gaelscoileanna and 18% are DEIS schools). The proportion of schools participating by county below highlights greatest participation rates from counties close to showcase event locations: Dublin, Wicklow, Limerick, Louth, and Meath. The lowest participation rates can be seen from schools in Northern Ireland. Antrim, Armagh, Down, Fermanagh and Tyrone all have participation rates of less than 2% with Derry as the exception with 5% of schools participating.

[1] This figure assumes 25 children per class.

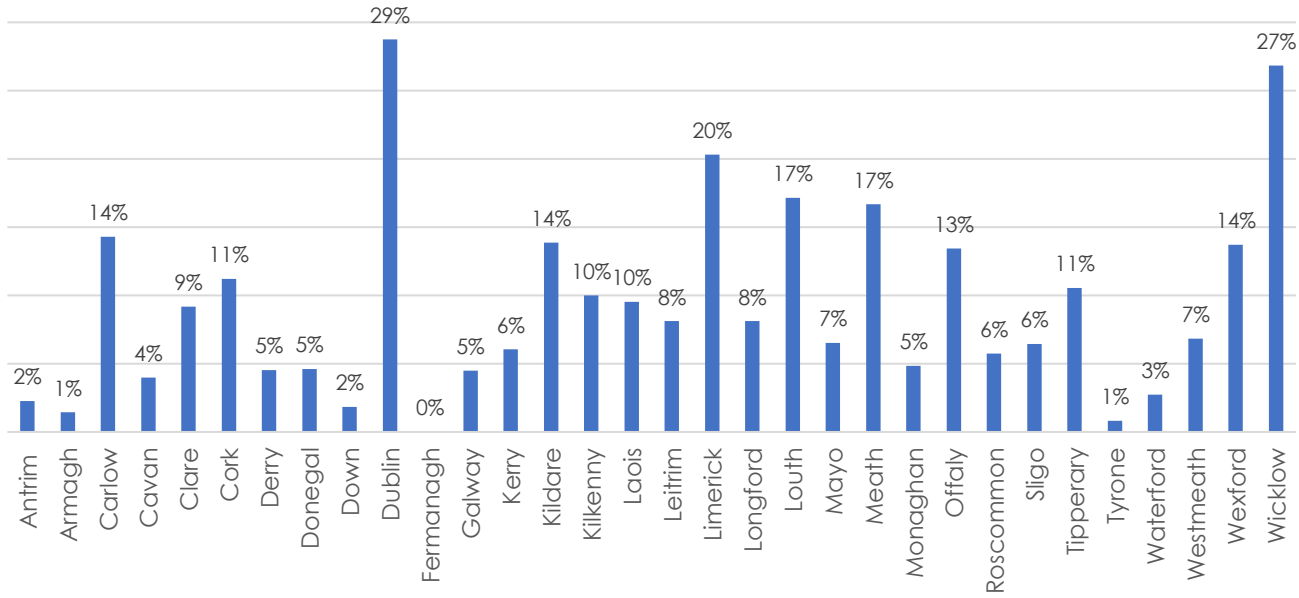


Figure 1: Reach of ESB Science Blast by county in 2024[2]

1.4 Evaluation Purpose and Approach

Quality Matters were contracted in November 2023 to conduct the evaluation. The purpose of the evaluation was to understand:

- The impact of the programme on children and teachers.
- Key features of the programme and improvements that could be made.
- Barriers to participation for non-participating schools.
- Recommendations for expanding and deepening the programme.

A mixed methods approach was taken which involved consultation with eight key informants with insights into the policy, funding and educational context for the programme, in-person interviews with teachers and children attending the RDS showcase event in March, surveys of children and teachers attending the RDS showcase event, interviews with teachers participating virtually, and interviews with teachers and principals from non-participating schools.

1.5 Outline of Report

This report begins by outlining the evaluation methodology step by step. It then highlights insights from several key informants on key developments which are of importance to the programme context. The next chapter outlines findings from the consultations with children, teachers and key informants on the

[2] The proportion of participating schools per county was calculated using RDS Foundation data on schools by county, and data on total number of schools by county from the National School Annual Census for 2023-2024 for the Republic of Ireland, and the Northern Ireland Department of Education List of Institutions accessed at https://apps.education-ni.gov.uk/appinstitutes/default.aspx on 8 May 2024.

programme's strengths and areas for improvement. Outcomes for children, teachers and schools are outlined in the next chapter. The next chapter discusses barriers to participation based on interviews with teachers and principals from non-participating schools. Recommendations are then presented in the final chapter in relation to the future development and expansion of the programme. A draft Theory of Change for the programme is presented in an Annex, along with visuals highlighting a snapshot of the voices of children on specific themes related to their participation in ESB Science Blast.

This report would not have been possible without the valuable insights provided by hundreds of children and teachers participating in the programme – either through surveys, or interviews at the showcase event. Teachers and principals from schools who were not participating in the programme also graciously gave their time and shared insights on barriers to participation, as did several key informants across education, government, and industry. Quality Matters and the RDS Foundation are grateful to all those who offered their time and insights to inform this report.

2 Methodology

2.1 Overview

The evaluation of ESB Science Blast was undertaken by the RDS Foundation in partnership with Quality Matters, an independent research charity. The purpose of the evaluation was to analyse outcomes for students and teachers across a range of contexts, identify barriers to participation in the programme, and identify recommendations for future development of the programme.

The evaluation used a mixed methods research approach, which involved key informant interviews to understand programme context, an online survey for teachers and a paper survey for children, interviews with teachers and children participating at the event, interviews with teachers who hadn't participated in the programme or participated virtually, and workshops with the RDS Foundation to develop a theory of change at the outset of the evaluation, and then to develop and agree recommendations for the future development of the programme at its completion.

2.2 Step 1: Scope of the Evaluation

The scope and key objectives of the evaluation were agreed upon with the RDS Foundation. The objectives were to:

1. Situate the programme in the national education landscape, assessing awareness and understanding of the programme in schools, industry and among policymakers.
2. Evaluate the impact of the programme on students and teachers at primary level across a range of different contexts including Gaelscoileana.
3. Identify barriers to participation in the programme and barriers to teaching STEM in the classroom in general.
4. Identify recommendations for future development of the programme, in particular areas for programme improvement, adaptations to strengthen outcomes over the long term, and potential for further scaling while retaining programme impact.

Particular attention was given to capturing feedback from:

- Children in attendance at the showcase event in Dublin.
- Teachers and children in relation to the dedicated programme for Gaelscoileanna.
- Teachers and principals from non-participating schools.

2.3 Step 2: Desktop Review

A short desktop review was undertaken to review programme materials, and the evolution of the programme to date.

2.4 Step 3: Key Informant Interviews

Interviews were held with eight key informants across industry, the Department of Education, and education agencies and bodies to inform the programme context and identify strategic issues to be considered in the future. Interviewees were asked about major developments in STEM education in Ireland in the last 10 years, other STEM programmes and initiatives with a focus on gaps and alignment of programmes, and what helps and hinders teaching of STEM in primary schools. They were also asked for their opinions on the value of ESB Science Blast and how it might be expanded in future to deepen and sustain its impact.

2.5 Step 4: Development of Theory of Change

On 24 January 2024, Quality Matters met with the RDS Foundation to co-design a Theory of Change (TOC) for the programme. Participants included the Foundation Director, members of the Science and Technology Programme team, the Arts Programme team, Fundraising team and the RDS Science and Technology Committee. A draft TOC was developed, along with strategic issues to be explored in the evaluation. The TOC supported the development of research tools to be used in the research.

2.6 Step 5: Development of Surveys

Two surveys were developed to gather views of children and teachers participating in the RDS showcase event between 4 – 7 March 2024.

2.6.1 Children's survey

The children's survey sought to capture children's feedback on participation in the programme in their own words. It included 10 questions asking them to rate the best things about the project, the showcase event, and how it compared to other work they did in school. It also sought to understand how child-led the project was by asking children who was responsible for deciding on the focus for the investigation. The survey included rating-style questions about outcomes they experienced in relation to communications skills, teamwork, problem-solving, scientific skills, confidence and STEM aspirations. To support analysis of factors which could impact outcomes for children, the survey asked some background questions about children's gender, school class, type of school, origin of parents or guardians, whether their parents or guardians work in a science, technology, engineering, or maths job and whether science is considered important in their school. The survey was reviewed and refined by two primary school teachers to ensure child-friendliness of the questions and language.

The introduction to the survey also explained to children who the feedback was for and how it would be used. In line with Lundy's children's participation framework, it is recommended that a short set of key messages about children's perspectives and how they influenced any changes to the programme be developed and disseminated to participating schools to share with children ahead of the next showcase event.

2.6.2 Teachers' survey

The teachers' survey sought to capture teachers' feedback on the programme, reasons for participation, key components of the programme, challenges, the supports that teachers need to participate, and any recommendations to sustain and deepen impact. A series of rating-style questions asked about outcomes they saw for children in relation to communications skills, teamwork, problem solving, scientific skills, confidence and STEM aspirations; outcomes for teachers in skills and confidence in inquiry-based learning, teaching STEM and integration; and outcomes for schools. Teachers also responded to several questions regarding demographic information about their class, school and prior experience of teaching ESB Science Blast and the skills involved.

2.7 Step 6: Data Collection

Data collection for the evaluation was done between March and May 2024 in four ways:

2.7.1 Children's survey (4-7 March 2024)

The children's survey was available for children to complete at the main information desk. Posters at key locations throughout the event highlighted that children who responded to the survey would be in with a chance to win one of four IPADs for their school as an incentive. Staff also distributed the survey to children at their stands and signposted children to the surveys at the RDS showcase event on three out of the four showcase days, which included the dedicated day for Gaelscoileanna to ensure their perspectives were captured. The staff team, which was comprised of Quality Matters staff and ESB Science Blast Brand Ambassadors, were briefed each morning on how to approach children, key messages to emphasise, and how to support children answering questions if needed. The survey was anonymous, so children were not asked to identify themselves.

Data from all children's surveys were inputted into SoGoSurvey, an online survey software, following the event. The children's survey received 693 responses in total.

2.7.2 Teacher's survey (4-22 March 2024)

An online survey developed using SoGoSurvey, was sign-posted to teachers throughout the RDS showcase event on three out of the four showcase days (which included the dedicated day for Gaelscoileanna) to ensure their perspectives were captured. Posters at key locations throughout the event advertised the survey. Staff also signposted the survey to teachers at key times throughout the event. Teachers were offered a chance to win one of two 150 euro and one of two 50 euro One for All Vouchers as an incentive. The RDS Foundation promoted the survey to teachers in the post-event materials. The online survey was left open after the event up until 22 March.

The teachers' survey received 177 responses in total.

2.7.3 Interviews with children and teachers at RDS showcase event (4-7 March 2024)

Short interviews were conducted with 43 children and 34 teachers on Monday, Tuesday, and Thursday of the ESB Science Blast event to gain their feedback on 2024 ESB Science Blast. This included children attending the dedicated day for Gaelscoileanna. Efforts were made to conduct interviews with children and teachers in Irish on the day for Gaelscoileanna so that they could talk about their experience in their own language. Children were asked about their experience of ESB Science Blast, what impact it had for them (e.g. in developing key skills or future STEM study or work aspirations), any suggestions they had for improvement and what would help sustain the excitement of science for them in the future. Teachers were asked about their experience of ESB Science Blast; the most important elements of the programme, the impact on their class and themselves, any challenges they face and possible supports, suggestions for improvement to the showcase event and what could sustain their students' excitement following participation at the showcase.

2.7.4 Interviews with non-participating school principals and teachers (29 April – 3 May 2024)

Interviews were held with seven teachers and five principals from schools in Donegal, Dublin, Galway, Kerry, Laois, Leitrim, Mayo, and Meath who had never or were no longer participating in ESB Science Blast. Schools from under-represented regions were targeted for interviews. Interviews sought to understand barriers to participation in ESB Science Blast and identify the support schools need to participate in ESB Science Blast or other STEM initiatives.

2.7.5 Interviews with teachers participating virtually in the programme (6 – 13 May 2024)

Interviews were held with two teachers who had participated in the programme virtually – i.e. without attending a showcase event in Dublin, Limerick or Belfast. Instead the class had an online discussion with a judge in May where they presented on and got feedback on their project.

Teachers and children interviewed at the RDS showcase were randomly selected with a view to getting a range of locations, types of schools, genders and backgrounds. Special schools were specifically targeted for interviews to understand their experience.

2.8 Step 7: Data Analysis

The data for this evaluation was analysed in two ways. First, all data was coded (assigned a code that made it easier for data to be reviewed and analysed). Responses were separately analysed to determine differences in outcomes experienced based on gender, school class, type of school, origin of parents or guardians, whether their parents or guardians work in a science, technology, engineering or maths job and whether science is considered important in their school. Significant differences reported are those where the differences between outcomes was greater than 10%.

Second, qualitative data gathered from both the online survey and interviews with children and teachers was thematically analysed to identify patterns in responses and to identify the most important themes. This analysis was used to determine elements of the programme valued by children and teachers, teacher support needs, and suggestions for future development. Responses from Gaelscoileanna were also analysed separately to assess any differences in qualitative feedback given in relation to the dedicated day for Gaelscoileanna.

2.9 Step 8: Development of Report

The report presents findings from both qualitative and quantitative research.

Quotes from key informants, children and teachers are used throughout the report. For children and teachers, where information was available about their county, class or age, or if the school was a DEIS school, this was included. Where no demographic information was available, these are labelled as child or teacher only. In some cases, where there might be a risk that the comment could be attributed to a specific individual or school because of related information, this was excluded. Visuals capturing the voices of children to illustrate key themes are included in the Annex.

The following conventions are used to describe qualitative data from children and teachers.

Almost all	Over 95%	A large number of	Over 100 responses
A large majority	Over 75%	Many	Over 25 responses
A majority	Over 50%	Some	10 – 25 responses
A large minority	Over 25%	Several	Over 5 responses
A small minority	Less than 15%	A few	Less than 5 responses

The following conventions are used to describe qualitative data from non-participating schools.

Most	Mentioned by nine or more interviewees
Many	Mentioned by six or more interviewees
Several	Mentioned by three or more interviewees
One	Mentioned by one interviewee only. These are included to give more specificity to themes or suggestions made.

2.10 Development of Recommendations

Suggestions from children and teachers were used to inform draft recommendations, which were discussed and reviewed in a workshop with the RDS Foundation staff. The focus of the workshop was to discuss potential changes to the model and co-develop recommendations for the future expansion of ESB Science Blast.

2.11 Report Limitations

There were several limitations to this evaluation. Below is a summary of these issues, and how they were addressed in this project.

2.11.1 Positive responder bias

This bias refers to a potential for a respondent to feel inclined, either consciously or subconsciously, to provide positive answers. To minimise the effect of this bias, all participants were informed that the evaluation and analysis of data was being undertaken by an independent evaluator. To encourage honesty, participants were also informed their responses would be kept anonymous and no comments would be attributed to specific individuals.

2.11.2 Feedback on Dublin event only

While the RDS Foundation runs events in Dublin, Limerick and Belfast for children to showcase their projects, given the timing of showcase events in Limerick (21-23 May) and Belfast (4 June), this evaluation only incorporated feedback from participants at the Dublin showcase.

2.11.3 Perspectives from Northern Ireland were not included

The evaluation focused on capturing feedback from children and teachers at the Dublin showcase event rather than the Belfast showcase given the timing. While attempts were made to invite non-participating teachers and principals from Northern Ireland to a focus group discussion on barriers, there was no uptake. Considering the recent review by the RDS Foundation into specific barriers in Northern Ireland (McGleenon and Harrington, unpublished), the RDS Foundation agreed to focus interviews on non-participating schools from the Republic of Ireland. As a result, except for the perspectives from the key informant from Northern Ireland, the evaluation does not offer any new perspectives into the programme successes and barriers there.

2.11.4 Small sample of virtual participants

Only a small number of schools participated in ESB Science Blast virtually in 2024 (n=3). Feedback on the virtual programme was received from only two participants, so might not be representative of what a wider experience of participating virtually would be.

2.11.5 Short term versus longer term impact

Understanding what impact ESB Science Blast has for children, teachers and schools in the months and years after participation in the programme would be most effectively answered by assessing the counter-factual – i.e. what would have happened anyway? This would have required a different evaluation methodology where children in otherwise alike schools are assessed to see if they have the same level of curiosity and inquisitive learning. The approach would also require some longitudinal data collection to assess how ESB Science Blast influences future education. It is recommended that this type of evaluation is considered in the future.

3 ESB Science Blast Programme Context

3.1 Introduction

Science, technology, engineering and mathematics (STEM) education in Ireland has been recognised as crucial not only for Ireland's economic prosperity given the growing demand for workers with STEM skills, but also to support young people to become active citizens, to engage with modern communications and media in a critical way, to support their own personal well-being and to make informed choices about many aspects of their lives. This chapter gives an outline of some of the major developments in STEM education in Ireland in the past 10 years from the perspective of eight key informants. It does not seek to present a comprehensive or exhaustive overview of key developments or challenges in the sector. Instead, it gives a snapshot of key developments in STEM education at primary and post-primary level, which affect the context for ESB Science Blast. These are described by eight key informants across industry, government, and education sectors who were selected based on insights they could offer into the evolution of the programme in Northern Ireland, the needs of Gaelscoileanna, developments in teacher training and curriculum, the links to secondary school science, Department of Education policy and funding work, and alternative STEM initiatives.

3.2 Perspectives of Key Informants

Key informants shared their perspectives on some of the biggest developments in STEM education over the last 10 years which are of relevance for ESB Science Blast.

3.2.1 The 10-year vision for STEM education

Several key informants referenced the STEM Education Policy Statement 2017 – 2026 which contains the government's vision for STEM policy up to 2026, along with implementation plans over three phases. It sets out both strengths of STEM education in Ireland and areas for development across the school system, in early years settings, schools, initial teacher education and ongoing professional development, further and higher education, informal learning and arrangements for evaluation and quality assurance.[3]

[3] The backdrop to the new policy was a review of STEM education in the Irish School System in 2016 which identified a range of challenges to STEM education in schools. For example, while improvements were seen in Ireland's performance in international assessments such as TIMSS (Trends in International Mathematics and Science Study) and PISA (the OECD's Programme for International Student Assessment), challenges were highlighted for primary and post-primary students with higher-order thinking skills (e.g. applying knowledge and problem solving) in maths and science. The review pointed to 'mathematical under-preparedness' of students entering third level, a lack of basic skills of some students sitting Higher Level mathematics, imbalances in the number of students studying Leaving Certificate Biology compared to the other Science subjects, and significant gender differences in the selection of Science subjects at Leaving Certificate. The review also highlighted the significant under-representation of women in the STEM workforce in Ireland, contributed to by third level choices and subject selection at post-primary. A Review of Literature to Identify a Set of Effective Interventions for Addressing Gender Balance in STEM in Early Years, Primary

One key informant from the Department of Education highlighted how STEM learning has been recognised as a national educational priority and is evidenced across different strategy documents including the Action Plan for Education, Ireland's National Skills Strategy, the Digital Strategy for Schools, the Arts in Education Charter, and the National Strategy: Literacy and Numeracy for Learning and Life. The vast number of applications for the new STEM learning grant scheme in 2023 was highlighted as evidence of the appetite for more resources to support STEM learning in schools (the grant provided up to €1.5 million to support schools with STEM learning opportunities through grants of up to €10,000 each). The Department also produced guidelines for STEM education partnerships for schools and industry engaging with each other.

3.2.2 Changes to curricula in primary and post-primary schools in the Republic of Ireland focusing on skills needed for the 21st century

Several key informants spoke of the importance of the changes to primary and post-primary curricula in the Republic of Ireland. In secondary schools, the new Junior Cycle, introduced on a phased basis between 2014 and 2021, included a bigger focus on discovery learning, which encourages a different way of teaching, and a different way of learning, which focuses on practical learning. Children are encouraged to question rather than memorise information. This approach benefits students with different learning abilities, enabling them to succeed, according to one key informant. While experiments would have always been part of science teaching, the view of another key informant is that teaching has shifted away from this in recent times, with teachers collecting and gathering resources to support students rather than lecturing on specific topics, backed by experiments. Another key informant highlighted the positive impact of these shifts on students, which included increased participation and involvement, and greater levels of enthusiasm and excitement for science. Similarly the Senior Cycle curriculum is under review, and new curricula for biology and chemistry are expected soon, including 40% project work rather than being 100% exam based, which key informants suggested might encourage subject uptake.

In primary schools, the new Primary School Curriculum Framework provides the direction and destination for learning across the four stages of primary school. It replaces individual subjects with broader curriculum areas as shown in Figure 2 (1. Language, 2. STEM, 3. Wellbeing, 4. Arts Education, and 5. Social and Environmental Education). It also outlines seven key interconnected competencies which are embedded across curriculum areas, as shown in Figure 3.

According to a key informant, whereas formerly the teaching of maths or science in the classroom would rely on teacher interest or expertise; by September 2024 the new maths curriculum will be

and Post-Primary Education in 2020 informed the development of Recommendations on Gender Balance in STEM Education in 2022.

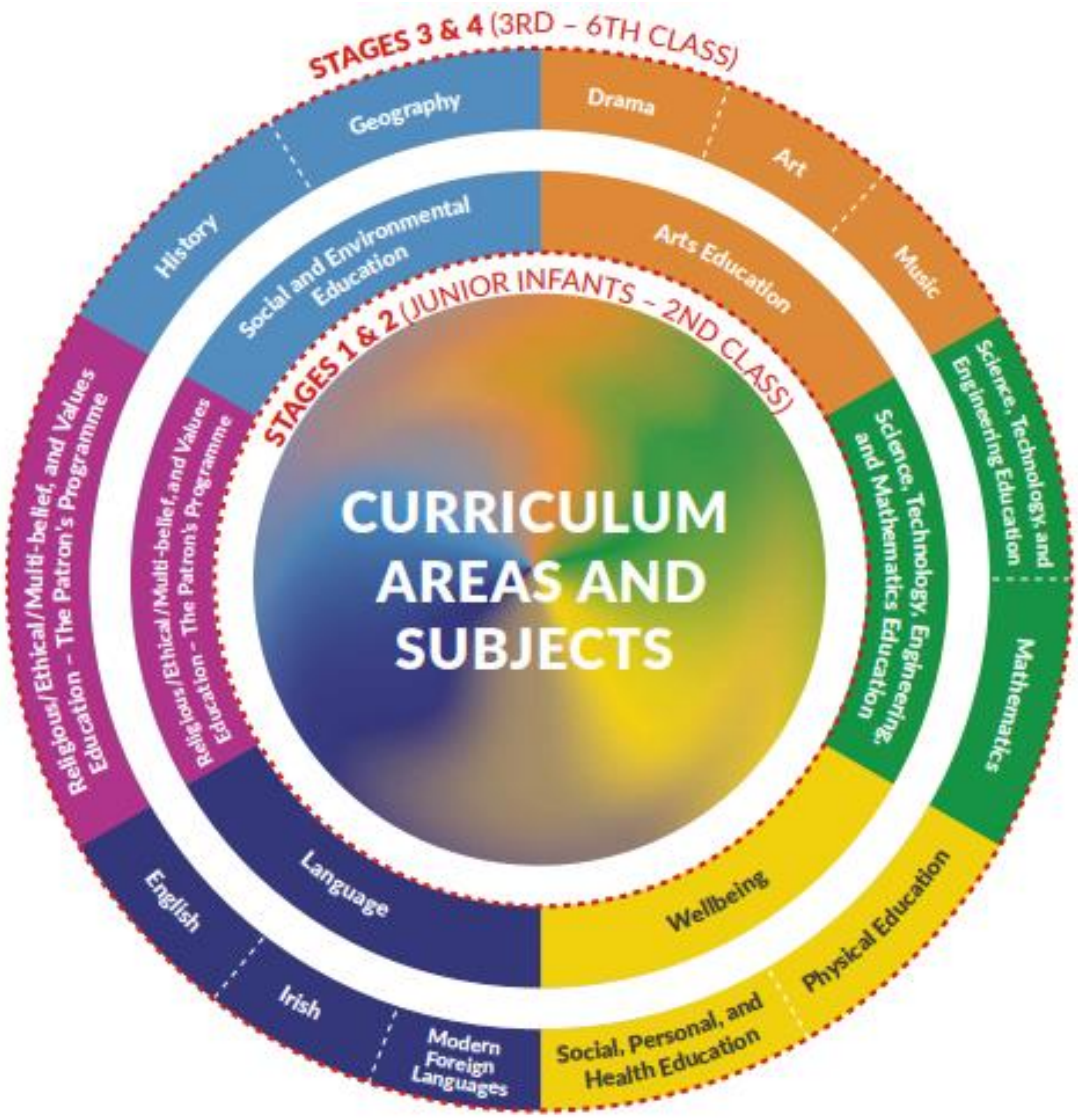


Figure 2: Curriculum areas and subjects, Primary Curriculum Framework for Primary and Special Schools, NCCA, 2023, p15

implemented in every class and form a basis for inspectors to assess schools. The curriculum includes minimum monthly allocated time to spend on STEM which according to another key informant helps teachers know that they are legitimately spending time on STEM and meeting curriculum demands.

One key informant highlighted how scientific inquiry is a promoted pedagogy central to the new draft science curriculum, which will be assessed by the Inspectorate. Design thinking and computational thinking are also promoted pedagogies and integrated STEM learning, whereby children are supported to connect their learning across Science, Technology, Engineering and Mathematics and to apply this

to real-world and imagined contexts, is encouraged. They highlighted how these are natural entry points for ESB Science Blast in the curriculum[4].

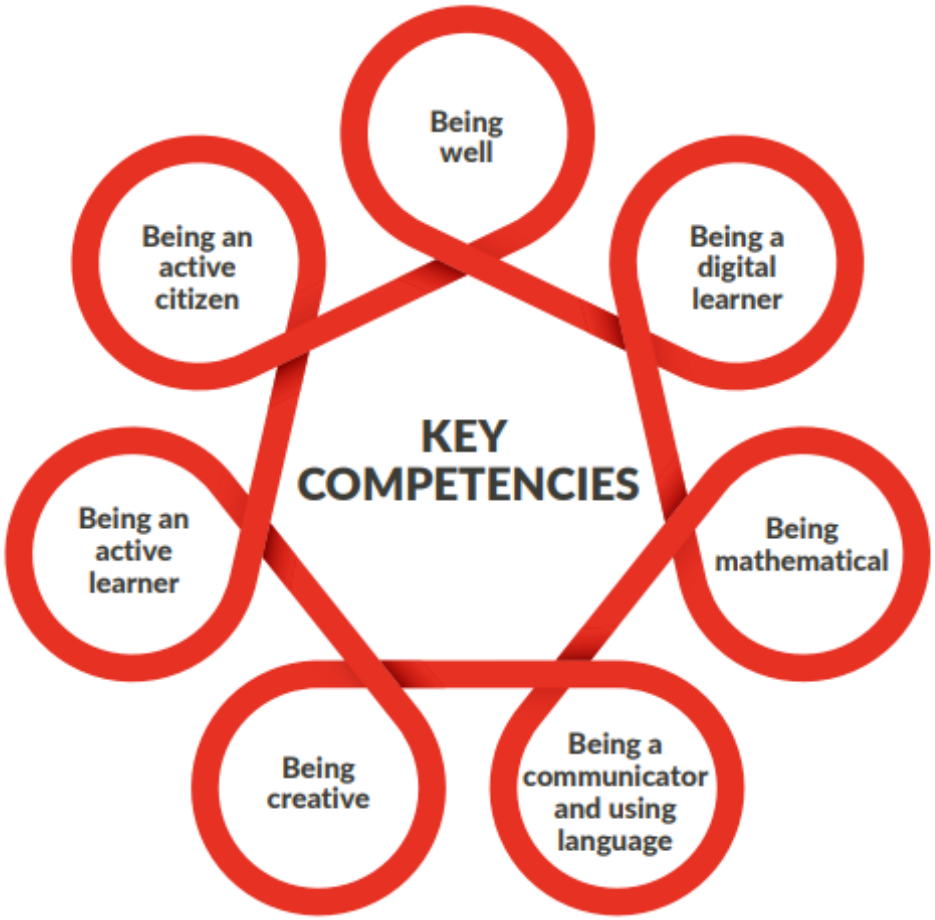


Figure 3: Primary Curriculum Framework for Primary and Special Schools, NCCA, 2023, p8

[4] In March 2024, the NCCA released *Draft Science, Technology and Engineering Specification. For primary and special schools. For consultation*. The draft encourages teachers to promote scientific inquiry by adopting an open-minded and curious disposition themselves, presenting children with opportunities and materials to actively engage in scientific inquiry, facilitating children to use their agency to choose questions/challenges that interest them, enabling children to discover knowledge that is new to them through their own investigations, drawing children's attention to the scientific skills they are using and how they are working 'like a scientist', encouraging children to apply their mathematical skills when gathering evidence, interpreting, analysing and reporting on the inquiries they pursue, giving children opportunities to engage in different types of scientific inquiry, encouraging children to persevere with their inquiries when they encounter obstacles, emphasising the importance of evidence in making scientific arguments, fostering a culture of scientific collaboration in the classroom, engaging in reflection on skills used, content learned, and connections made to the scientific world, encouraging children to be aware of scientific inquiries in the news, online and in the world around them.

3.2.3 Increased STEM education initiatives

Several key informants highlighted the impressive range of informal STEM education sector initiatives, which operate outside the formal curricular teaching in schools, giving examples, some of which are long-standing initiatives, others which are newer or have expanded in recent years.[5]

Secondary schools

- SciFest: a programme of one-day STEM fairs for secondary students, established in 2006, expanded from five participating schools in 2011 to 105 participating schools in 2022/2023. It aims to encourage a love of science, technology, engineering, and maths through active, collaborative, inquiry-based learning and to provide a forum for second-level students at local/regional level to present and display their scientific investigations.
- BT Young Scientist exhibition: an annual competitive science and technology exhibition for secondary school students in Ireland, North and South, which has been running since 1963. It is a competitive programme which involves projects from approximately 200 schools from across Ireland each year.
- The STEM Passport for Inclusion: a joint initiative by Maynooth University, Microsoft Ireland, SFI and DoE established in 2021 to address inequality in access to STEM careers among secondary school students in socially disadvantaged communities. It includes an educational qualification, education supports and mentoring from industry role models. Since 2021, 1250 girls from 38 schools have participated in the programme, which is due to be expanded to additional schools in its next phase.

Primary schools

- Science Week, Maths Week and Engineers Week were highlighted as initiatives which have had significant uptake among schools and include multiple offers from industry partners.
- SFI's Curious Minds Programme: a programme of support for schools to increase STEM education which includes an awards programme with different categories of progression for schools, as well as CPD and resources for teachers.

Primary and secondary schools

- Engineers Ireland STEPS Programme: an outreach programme promoting interest and awareness in engineering as a future career through a range of initiatives, including STEPS Young Engineers Award, a competition for 3rd and 4th class to develop an engineering project to support their local community, STEPS Engineering Your Future (STEPS EYF), a three - five day programme for Transition Year students to attend interactive talks, carry out group-based activities, and visit local industry, and STEPS Engineers Week, an annual week-long celebration of engineering in primary and secondary schools.

[5] This report by the Department of Education School Inspectorate in 2020 discusses implementation of initiatives in primary schools.

A key informant working in secondary school science spoke of a notable difference in incoming students to secondary school who had participated in primary school science initiatives. They said that in the past, science would be completely new to students, but now students were now beginning secondary school with increased knowledge and understanding of science, more practice of inquiry-based learning, descriptive writing, and of doing experiments, and as a result they were better educated and much more capable than what teachers previously expected.

'You can see that they have investigative minds.' (Key Informant 4)

3.2.4 Primary teacher training in STEM has expanded and is becoming more consolidated

Several advances have been made in teacher training, for example:

- While integration has been pushed for a long time in teacher training colleges, there are increasing integrated modules being taught (e.g. maths and technology courses now being delivered jointly by these professionals).
- Continued Professional Development courses in inquiry-based learning have expanded – e.g. the RDS runs one-week summer courses and SFI runs one day whole school in-service days on inquiry-based learning.
- The STEM Teacher Internship (STInt) Programme: a national programme providing primary & post-primary teachers with paid summer internships, in STEM roles, in a wide variety of industries across Ireland.
- The creation of Oide: a new agency supporting teachers and schools formed in September 2023, funded by the Department of Education, which amalgamates the four existing support services: Centre for School Leadership (CSL), Junior Cycle for Teachers (JCT), the National Induction Programme for Teachers (NIPT) and the Professional Development Service for Teachers (PDST).

3.2.5 Challenges remain for STEM education in Ireland

Key informants corroborated many of the issues facing primary teachers in STEM today highlighted in reports referenced above: time constraints and competing priorities among teachers and schools, lack of confidence in STEM subjects among primary school teachers, anxiety around maths among students, and a gender imbalance in STEM subject choices and careers which begins at a young age. One key informant highlighted additional challenges for Gaelscoileanna in finding suitable resources that they can use in the classroom through Irish. A significant challenge and area of need highlighted by one key informant was in partnerships between State and industry to ensure that all children, regardless of gender, background, or ability can avail of quality STEM experiences in school.

3.2.6 A more challenging entry point in Northern Ireland

One key informant highlighted that while STEM in the primary curriculum is much more central in the South allowing direct alignment between what schools are doing and what ESB Science Blast seeks to achieve, in contrast in Northern Ireland, STEM in the curriculum is much less developed and sits as an optional component which leaves it at the discretion of individual schools and teachers. They commented that promotional science initiatives were less joined up and appeared to be a collection of initiatives rather than a systemic change in approach to producing more integrated education. Given the degree of specialisation at an early age in post-primary education in Northern Ireland, it was considered that ESB Science Blast presents an opportunity to stimulate a broader curriculum approach, and a more integrated education at primary school level, which breaks down the sense of siloes or defined career routes and patterns. The upcoming review of 'The World Around Us' in the Northern Ireland Curriculum in 2025 presents an opportunity for strengthening curricular links.

3.3 Summary

The past 10 years have seen huge shifts in the landscape for STEM education in Irish schools: new policy and funding initiatives in the sector, changes to primary and post-primary curricula focusing on skills needed for the 21st century, consolidation of teacher training supports, along with a plethora of STEM initiatives for schools to engage in at their discretion. Challenges remain in ensuring that all children, regardless of gender, background, or ability can access quality STEM experiences in school. The new science curriculum, which includes a strong focus on scientific inquiry and is expected to be rolled out in 2025, presents an important opportunity for partnerships and coordination to ensure that all children can access quality STEM experiences.

4 Key Findings

4.1 Introduction

This chapter presents key findings on the value, strengths, and areas for improvement of ESB Science Blast from the perspectives of different stakeholders. It is based on survey responses from 177 teachers and 693 children participating at the RDS showcase event, interviews with teachers and children at the RDS showcase event, 12 interviews with teachers and principals from non-participating schools, two interviews with virtual participants, and eight key informant interviews. It begins by giving an overview of perspectives from children and teachers and then summarises insights from key informants on the programme.

4.2 Perspectives of Children and Teachers

The perspectives of children and teachers participating at the RDS event were captured both via qualitative interviews at the event and via feedback forms distributed at the event. Both sets of feedback are included in the sections below.

693 children responded to the feedback form. Of those who responded most:

- were girls (67%, n=402)
- attended a mixed school (87%, n=535)
- were in 5th or 6th class (69%, n=416)
- had parents who were both born in Ireland (67%, n=402)
- didn't have a parent working in a STEM career / or didn't know that their parents did (61%, n=371)

177 teachers responded to the survey, providing information about their schools. Of these:

- 69% (n=123) came from medium to large-sized schools (i.e. had over 200 pupils)
- 69% (n=123) were urban schools
- 87% were mixed schools
- 2% (n=3) were special schools
- 18% (n=33) were Gaelscoil (i.e. Irish-medium schools where everything is done through Irish)
- 26% (n=47) were DEIS schools
- Most brought two or more classes (68%, n=120)
- Fifth and sixth classes were the most popular to bring (64%, n=194 out of a total of 304)
- Most had participated before (80%, n=142)

The breakdown of respondents by county and by area of Dublin is outlined below.

County	Percentage of total respondents	Number of respondents by county	Number of projects by county	Respondent sample size by county
Dublin	47%	83	263	32%
Wicklow	11%	19	41	46%
Carlow	5%	9	9	100%
Meath	5%	9	41	22%
Wexford	5%	8	20	40%
Louth	4%	7	16	44%
Kildare	3%	6	24	25%
Cork	3%	5	47	11%
Laois	3%	5	8	63%
Kilkenny	2%	4	12	33%
Galway	2%	3	21	14%
Mayo	2%	3	12	25%
Monaghan	2%	3	4	75%
Roscommon	2%	3	5	60%
Offaly	1%	2	17	12%
Cavan	1%	1	4	25%
Clare	1%	1	11	9%
Donegal	1%	1	10	10%
Kerry	1%	1	8	13%
Leitrim	1%	1	4	25%
Longford	1%	1	4	25%
Sligo	1%	1	5	20%
Westmeath	1%	1	7	14%
Limerick	0%	0	34	0%
Tipperary	0%	0	17	0%
Waterford	0%	0	3	0%

Figure 4: Respondents by county (n=177) compared to number of projects by county

Postcode in Dublin	Percentage	Number
D15	12%	9
D09	9%	7
D04	8%	6
D08	8%	6
D10	8%	6
D18	8%	6

D22	8%	6
D05	7%	5
D03	5%	4
D17	5%	4
D06	4%	3
D11	4%	3
D13	3%	2
D16	3%	2
D24	3%	2
D02	1%	1
D07	1%	1
D12	1%	1
D14	1%	1
D20	1%	1
D01	0%	0

Figure 5: Respondents by postcode (n=76)

Graphs are used to visualise quantitative data. The following conventions are used to describe data from children and teachers.

Almost all	Over 95%	A large number of	Over 100 responses
A large majority	Over 75%	Many	Over 25 responses
A majority	Over 50%	Some	10 – 25 responses
A large minority	Over 25%	Several	Over 5 responses
A small minority	Less than 15%	A few	Less than 5 responses

4.2.1 Level of school engagement with STEM and reasons for participation

In the surveys teachers were asked about their own background in STEM and the level of school engagement in STEM to understand the level of pre-existing engagement with STEM in school. Children were also asked for their perceptions of how much science they did at school.

Teachers' background experience in STEM varied quite a lot – only a small minority have a specific STEM background such as an undergraduate degree (5%) or CPD in STEM (21%). The majority would

have studied STEM subjects at school, either at leaving certificate (32%, n=129) or junior certificate (22%, n=73). A small number of teachers (3%, n=11) had no prior experience in STEM.

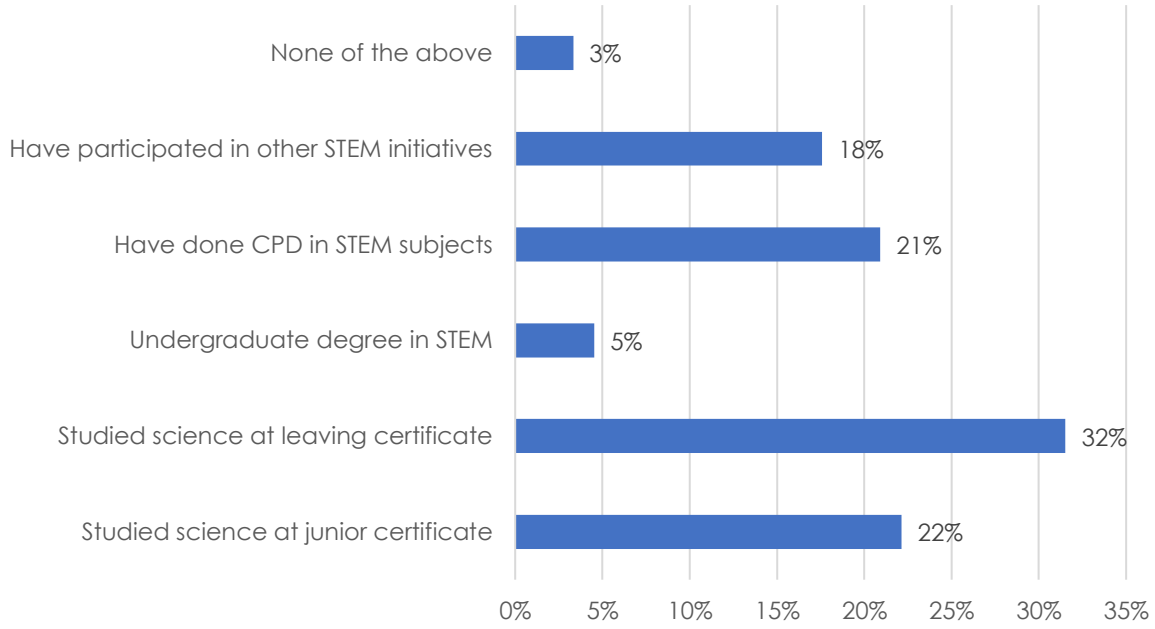


Figure 6: Teachers' level of experience teaching STEM (n=330)

As for confidence in inquiry-based learning, a large majority of teachers (74%) reported feeling confident in this area, with almost one-fifth of teachers (18%) reporting that they feel very confident.

As for how important science was in schools, or how much schools engaged in science initiatives, only a small minority (less than 15%) had a STEM staff post in the school or a dedicated STEM focus or plan in place within the school. The most common engagement with STEM was in Science Week / Maths Week or Engineering Week (39%). A small minority (less than 10%) have also engaged with Microsoft Dreamspace or have received a 'STEM in a box' before. This potentially suggests that only a minority of schools engage with multiple STEM initiatives.

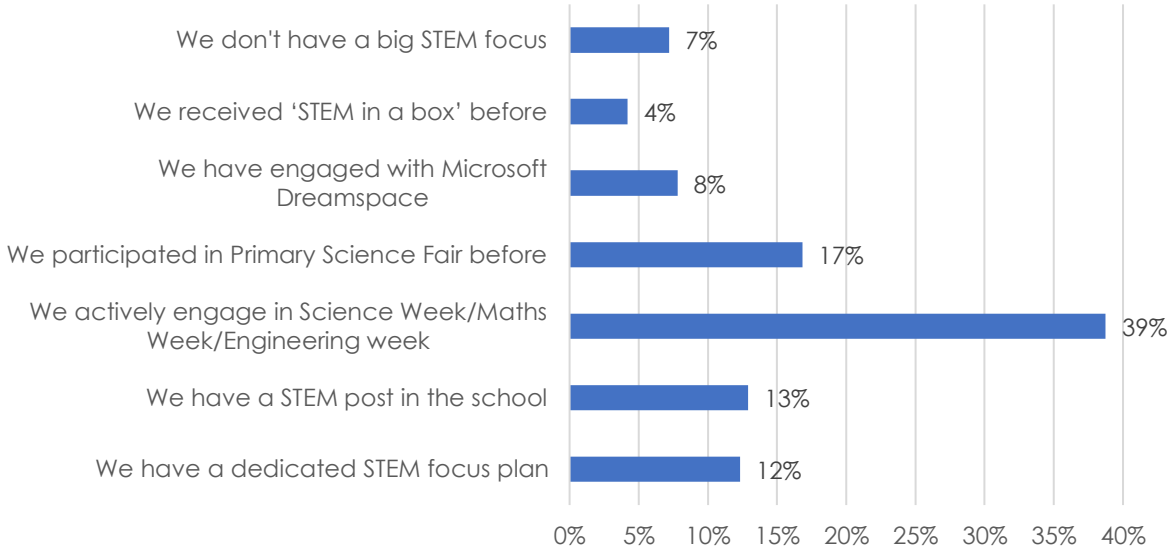


Figure 7: School engagement with STEM: Teachers' views (n=176)

The majority of children who responded to the survey felt that they did lots of science in school. On the other hand, a large minority felt that they didn't do much science or didn't know whether they did.

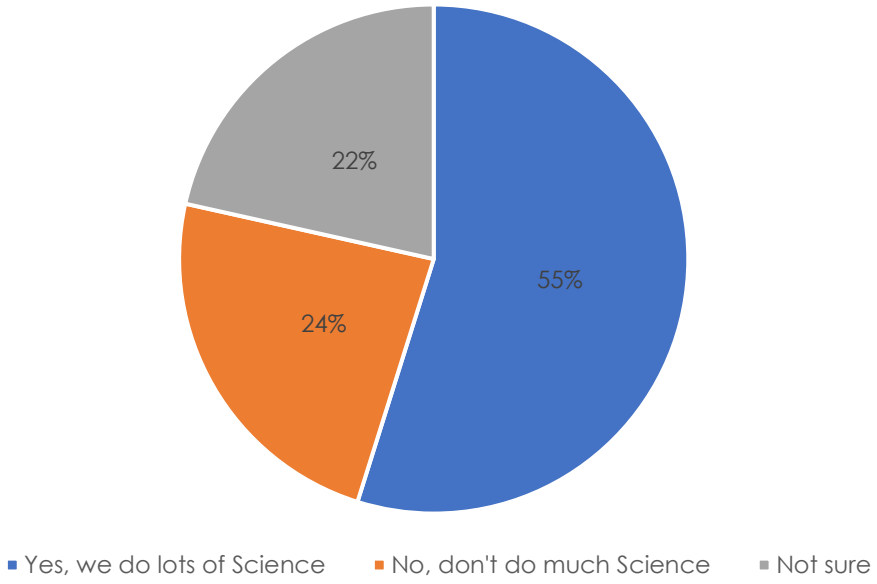


Figure 8: Children's perspectives on how much science they do in school (n=609)

As for reasons to participate, almost half of first-time participating teachers (n=48) cited that their primary motivation for participation was that they believed it would be a fun and engaging way to bring science into their classrooms (42%, n=20). Just over one quarter had received a recommendation to participate from another teacher (27%, n=13).

For returning teachers (n=283), a large majority decided to participate again because their students loved it (42%, n=119). Many also believed it helped them to teach STEM (23%, n=65).

4.2.2 Strengths of the programme

Children were asked to describe the best thing about ESB Science in an open-ended survey question, alongside rating the top features of the programme from a provided list. Teachers also rated the top features of the programme from a provided list in their survey. Children and teachers were also asked about the best bits of the programme in interviews. Insights from both sets of quantitative and qualitative feedback are included throughout this section.

The best bits / key features of the programme, as reported by surveys

Attending the RDS showcase (69%, n=474) and showing off their work to others (58%, n=404) were the most popular responses from children completing the survey, closely followed by talking to a scientist about their work (56%, n=386) and carrying out the investigation themselves (53%, n=368).

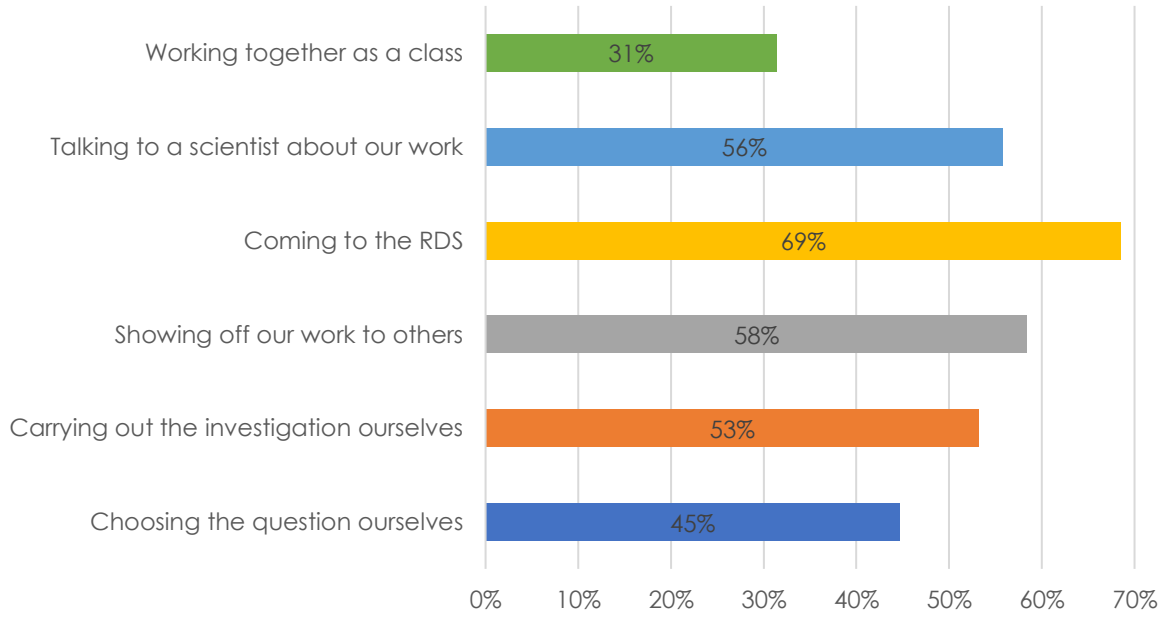


Figure 9: The best thing about ESB Science Blast: Children's views (n=636)

Teachers responding to the survey ranked the most important parts of ESB Science Blast from one (most important) to five (least important). The two most important elements of ESB Science Blast that teachers ranked were the child-led elements: letting the children carry out the investigation (37%, n=64) and letting the children decide what was investigated (37%, n=64). In contrast to children, teachers did not rate coming to the showcase event itself as the most important. Showcasing the findings to families was considered the least important part of the programme for teachers (50%, n=87), potentially because it wasn't a core part of the programme.

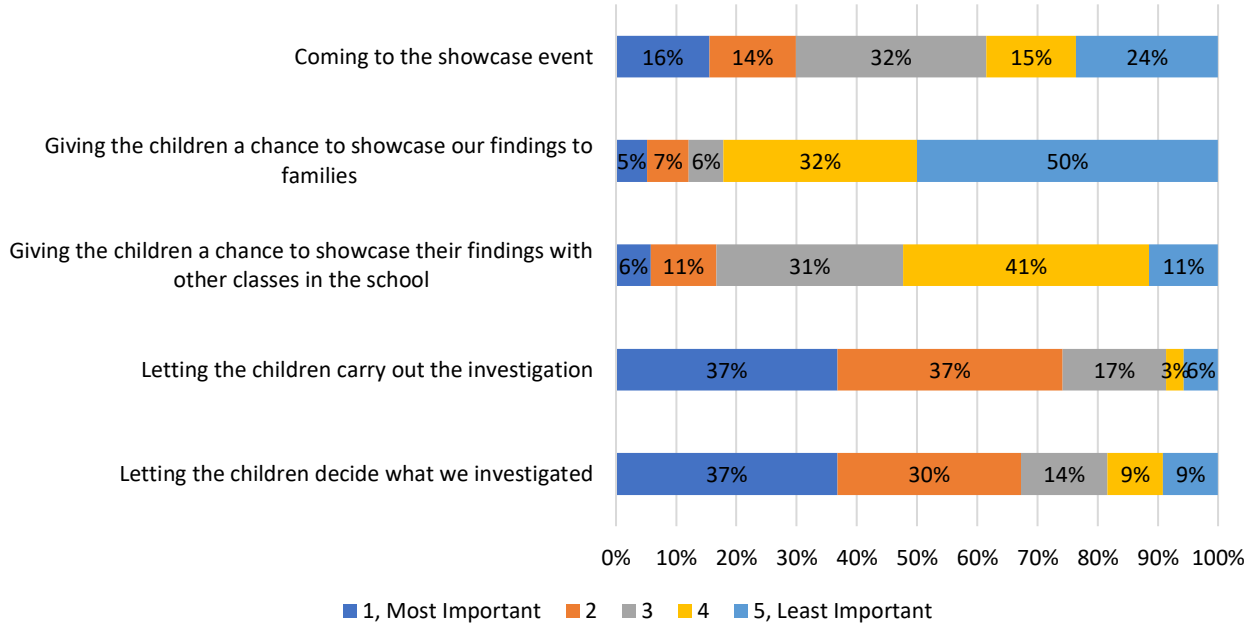


Figure 10: The most important elements of ESB Science Blast: Teachers' views (n=174)

The showcase event is highly valued by children and teachers

Children provided feedback on the best thing about ESB Science Blast in an open-ended question in the survey. The excellence of the big day out and the showcase event was one of the most common themes highlighted by children (28%, n=177). Specific elements of the showcase that children mentioned in their responses were the shows (10%, n=61), the stalls from other organisations (7%, n=46) the opportunity to meet new people and spend time with friends (6%, n=40), receiving prizes, gifts, food and freebies (6%, n=37), the chance for creativity, curiosity and innovation (4%, n=25) or a break from the usual school routine (4%, n=23).

'I think the best thing is the shows and the activities you can do here.' (Girl, 5th Class)

'Having so much freedom and getting to hang out with your friends.' (Girl, 4th Class, Dublin).

'The show, the VR and all the other stuff I'm having the best time and hope I can come here again.' (Child respondent)

'Their creativity and how nice they are to make these events happen.' (Boy, 5th Class, Wicklow)

Children appreciated the layout of the hall, the number of stalls, and the freedom to move independently around the hall with their friends as positive factors about the experience

'I think it was so fun. It had freedom, fun and so many amazing things to do.' (Boy, 4th Class).

'Getting to walk around and show people our project.' (Girl, Dublin, 6th Class)

'You get to wander.' (Girl, 4th class, Wicklow)

The opportunity to showcase their work to other children, adults, staff, and judges, and learn about other schools' projects was a recurring theme in children's feedback on the best thing about ESB Science Blast. The event gave children a sense of pride and accomplishment over their work.

'You get to explore and see what other groups had done.' (Girl, 5th Class, Dublin)

'The best thing about it is working together as a class and being able to show our creativity.' (Girl, 5th Class, Dublin)

'Sharing your thoughts and ideas. I feel like this event helps us evolve and move forward.' (Girl, 4th Class, Dublin)

'Working together as a class and having the chance to show our talent.' (Child respondent)

Many teachers (15%, n=25) in their survey responses and several teachers in interviews (n=5) appreciated the sense of safety and trust at the showcase that helped them feel comfortable allowing their students to roam the RDS freely.

'It's a safe space that they can wander around independently in, it's the right size, the shows are great, the companies are great, and the online resources are very useful.' (Teacher, Dublin)

Both children (28%, n=177) and teachers (47%, n=80) shared an appreciation for the organisation of the showcase event, highlighting the kindness of the staff, and how well-run it was.

'The exhibitions are amazing. It is great for the children to go around and see each other's work. The day is so well organised, and I did not have to be worried about safety. The children loved the various shows and stalls that were around.' (Teacher, Roscommon)

Children and teachers rated the most valuable parts of the showcase event in the survey.

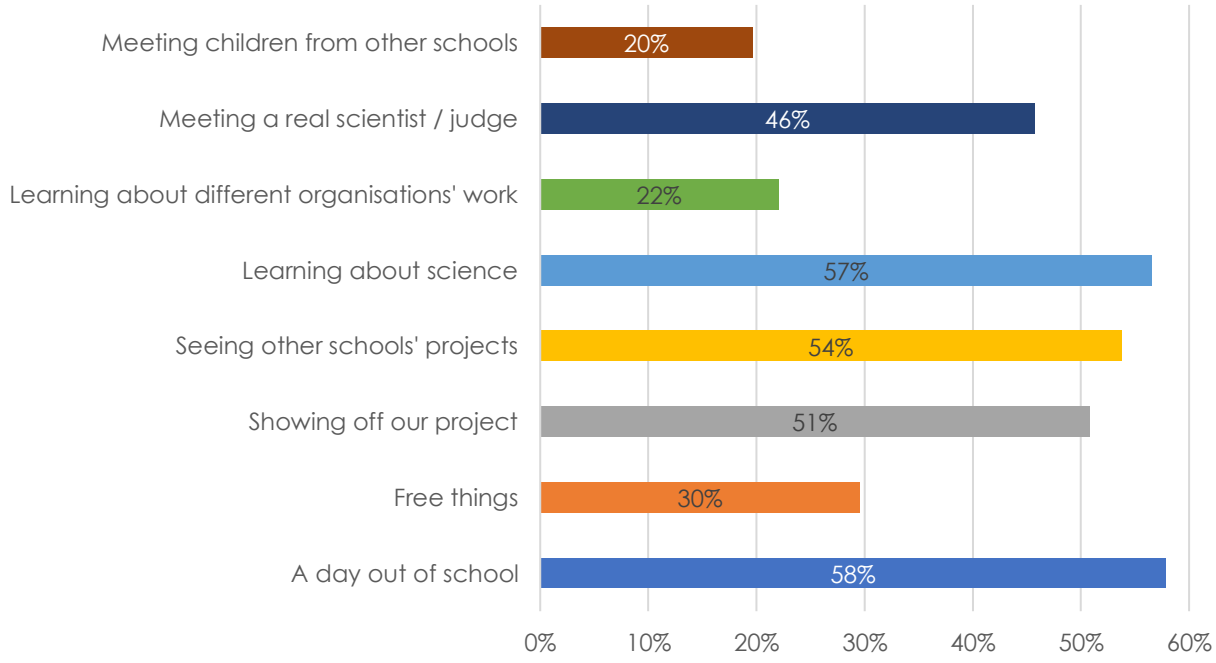


Figure 11: The best thing about the RDS showcase: Children's views (n=636)

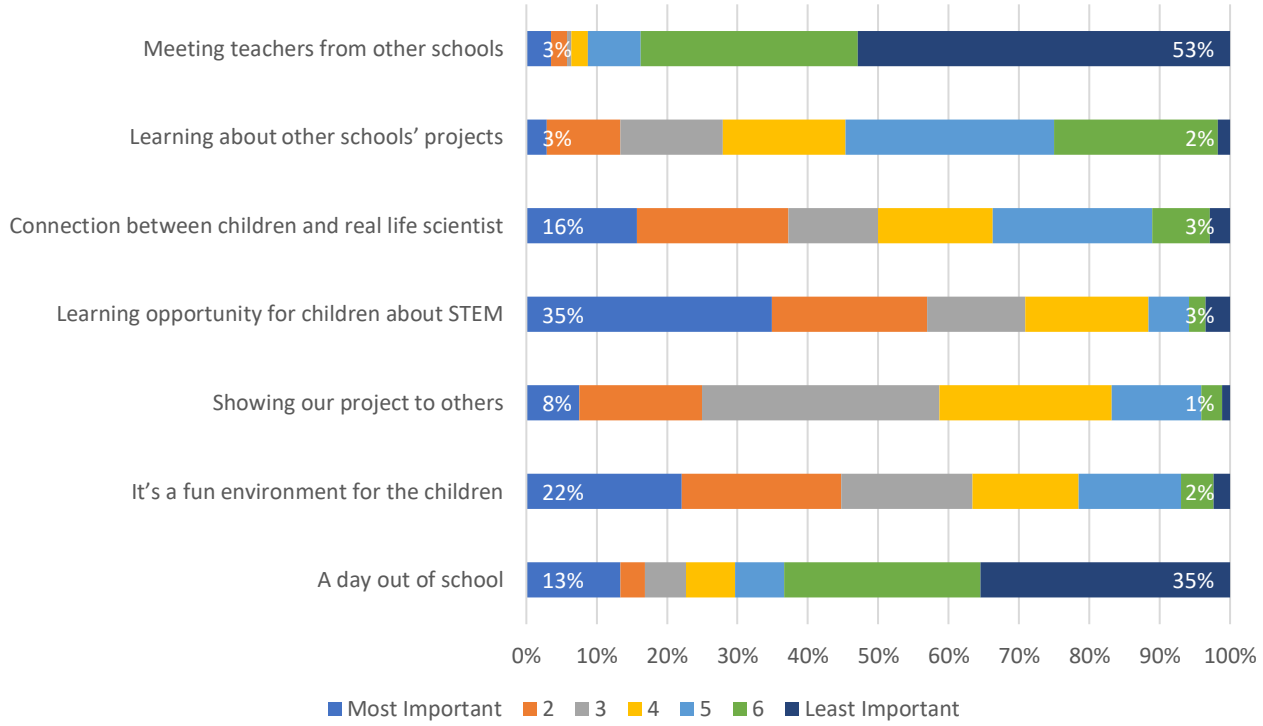


Figure 12: The most valuable elements of the RDS showcase: Teachers' views (n=172)[6]

Children were learning while having fun

A large number of children described the amount of fun they had doing their investigation, as well as participating in the showcase event, in the open-ended survey question (17% children, n=107). They explained that it was a great opportunity to learn in a fun way. This was also a recurring theme highlighted by children interviewed.

'I was so excited I couldn't sleep'. (Girl, 6th class, Dublin).

'It's better than normal science. I never really found science that interesting but now I do'. (Girl, 5th class, Wexford).

'It's probably the best subject ever. What we learned will affect what we put in our bodies'. (Girl, 4th class, Wicklow)

In another survey question, children were asked about how fun ESB Science Blast was compared to other things they did at school. Almost all reported that ESB Science Blast was more fun than the other subjects they do at school (97%, n=645), with a large majority reporting that it was "way more fun" (85%, n=564).

[6] Figures included in the graph represent only the most important and least important elements of the RDS showcase as rated by teachers.

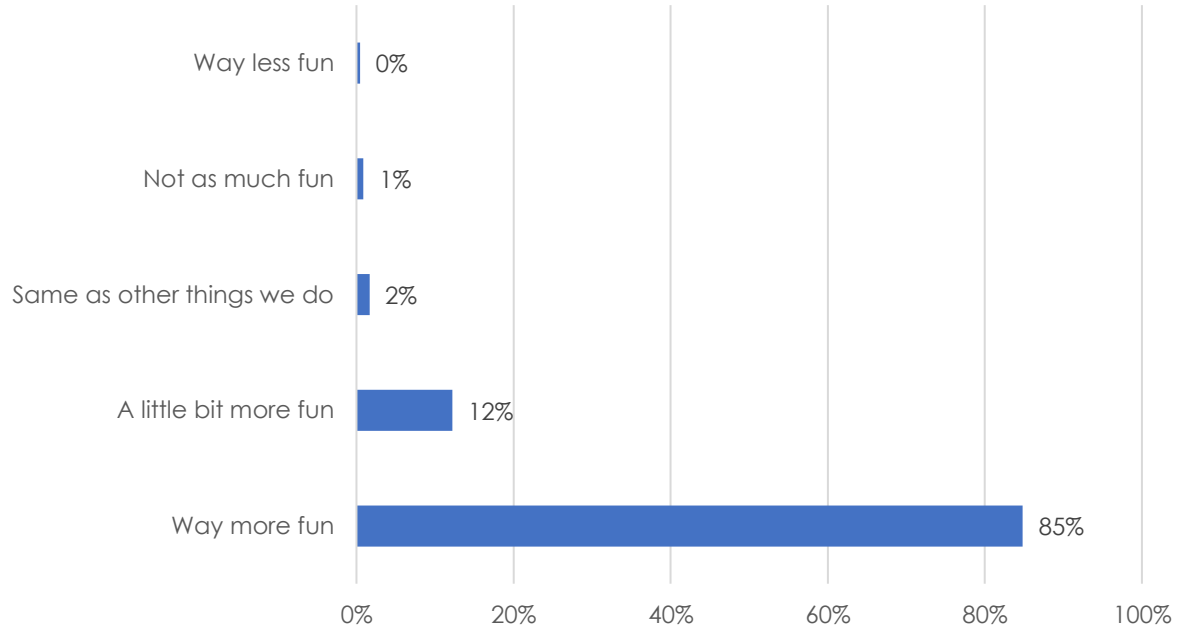


Figure 13: Children's views on the fun factor of ESB Science Blast compared to other things they do at school (n=665)

Teachers also described the wow factor for children of coming to an event like this.

'The kids won't remember what they did in Maths or English or Irish, but they'll remember this experience forever'. (Teacher, Roscommon)

'The best thing about Science Blast is the impact it has on the children and how much fun they have learning about the science involved in simple tasks. The children love seeing other schools' projects too'. (Teacher, Dublin 17, DEIS School).

It provides a unique opportunity to learn about science and develop key skills

Describing the best bits in their own words in the survey, children expressed happiness about the opportunity to learn new things and to engage with elements of STEM that they didn't know about before (23% children, n=149).

'It made me try an experiment at home.' (Boy, 3rd class, Wicklow).

They also expressed enthusiasm about the facts they learned from different organisations present at the showcase (20%, n=130). Children loved the ability to walk around to see other schools' work, learn from them and get inspiration for future projects.

'It's inspiring to learn about different ideas and what different people studied' (Girl, aged 11, Louth)

One-fifth of teachers named learning about science and skills development as the best thing about the programme (20%, n=35).

'The kids loved interacting with other schools. It creates a lot of interest. It opened kids' eyes to what science is and the nature of science.' (Teacher, Monaghan)

They highlighted the opportunity for teachers and students to connect with peers at the showcase and learn from one another as a significant benefit of ESB Science Blast (15%, n=25).

Doing the investigation as a class and working together was highlighted as one of the best parts of ESB Science Blast by many children (7%, n=47).

'We could choose which jobs we do which was great. We would usually do projects on our own. It was a bit weird working with others as a full group but fun'. (Girl, age 11, Meath).

Many teachers' responses contained an appreciation of the elements of teamwork and collaboration involved in ESB Science Blast too. They emphasised children's opportunities to work collectively as being important educationally. They acknowledged the opportunity it afforded to each child to get involved in the programme in a way that suited their strengths and needs, and greater awareness among their students in how to connect their different skills to elements of the project. Teachers acknowledged its impact on building confidence among their students (16%, n=28).

The child-led inquiry-based learning model is inspiring curiosity for children

Teachers highlighted the importance of the child-led, inquiry-based learning model promoted by ESB Science Blast (30%, n=51). Many teachers appreciated ESB Science Blast as an opportunity to promote STEM interest both within their class and within their school and highlighted greater STEM interest among students who had not expressed this before (18%, n=31).

'It makes them inquisitive'. (Teacher, DEIS school)

'The best thing about Science Blast is how it encourages children to think of questions themselves. Usually, as teachers, we present to them the question and then work with them to learn the answer. The Science Blast allows my students to think outside the box and become really creative'. (Teacher, Dublin 20).

'One of the best things about ESB Science Blast was that the children were free to pick and choose the various activities available on the day, so it felt like they were in charge of their own learning. The teacher wasn't making them do anything!' (Teacher, Gaelscoil)

'It gave all the children a voice. They took pride in what they were doing, it was nothing to do with me.' (Teacher respondent)

To assess how child-led the process of deciding on a topic for investigation was, the survey asked children who in their class decided on the question for investigation. Two-thirds of children (66%, n=436)

reported that the full class chose the topic collaboratively, suggesting projects were largely child-led. However, the findings still show a large minority who weren't necessarily actively involved in choosing the question given that the reported that either the teacher chose it, a group of children chose it, or they didn't know who chose it (24%, n=223).

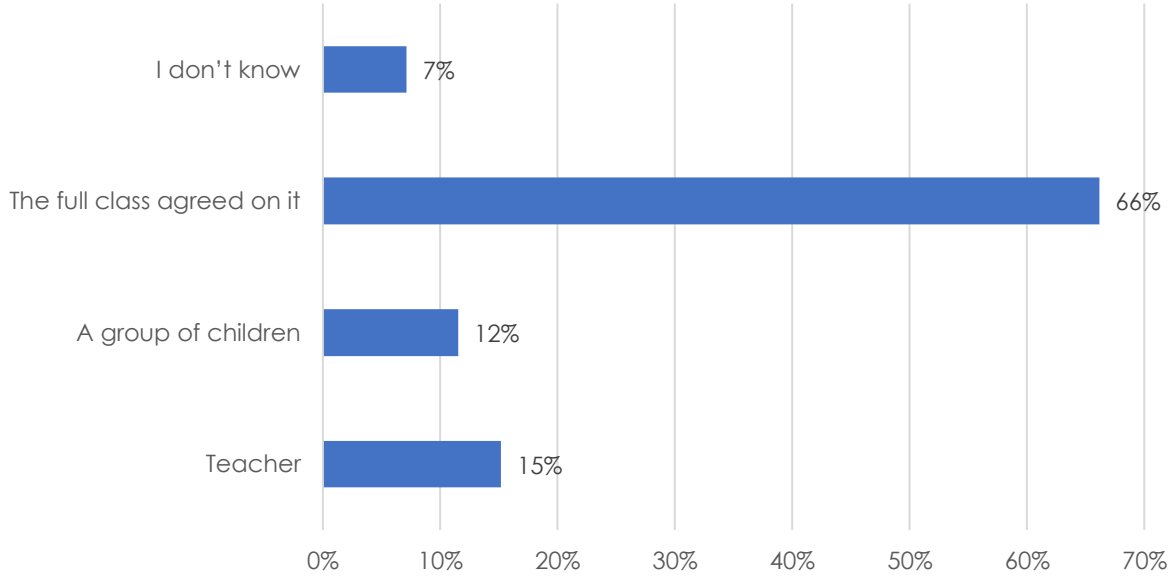


Figure 14: Children's perceptions of who chose the question for investigation (n=659)

Teachers value the opportunity for integrated interactive teaching and learning

Many teachers noted how they valued ESB Science Blast as a way of being able to cover multiple subjects in a cross-curricular manner, and how through one project they were able to cover so many different areas and teach in a hands-on interactive way which they might not usually do (15% teachers, n=25).

'We were able to cover a lot of schoolwork - we could do art, science and extracurriculars all together.' (Teacher respondent)

'It's easy to show this is worth it because it's cross-curricular.' (Teacher respondent))

The second term is the best time for the showcase

A majority of teachers deemed the second term to be the best time of year for the showcase (84%, n=144). This was consistent with feedback from virtual participants too.

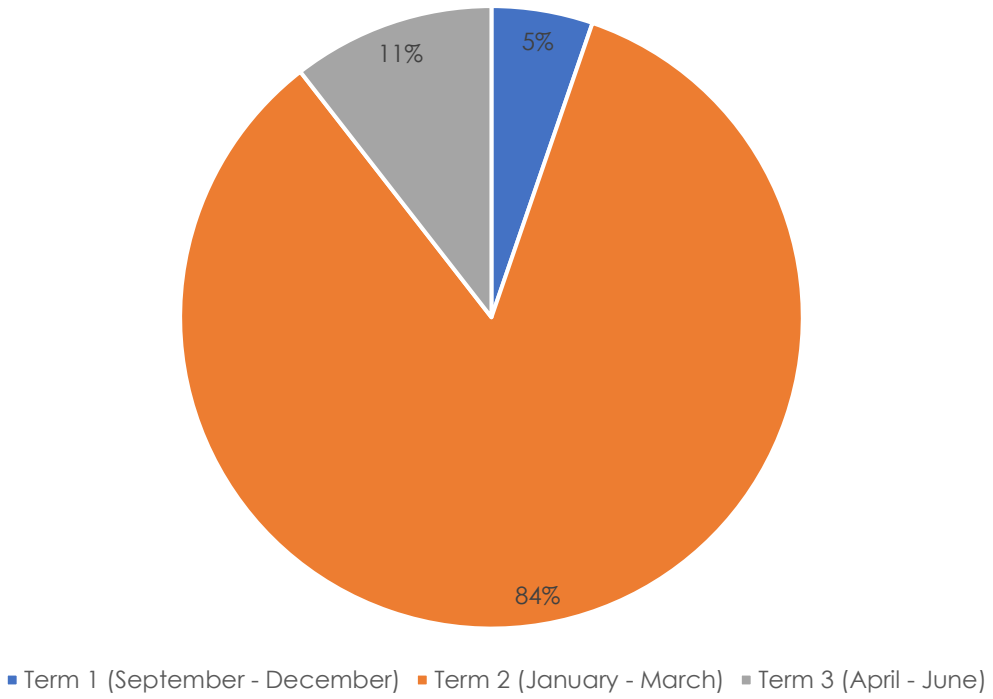


Figure 15: Teachers' views on best timing for the showcase (n=171)

Teachers want to be able to bring more than one class to the event

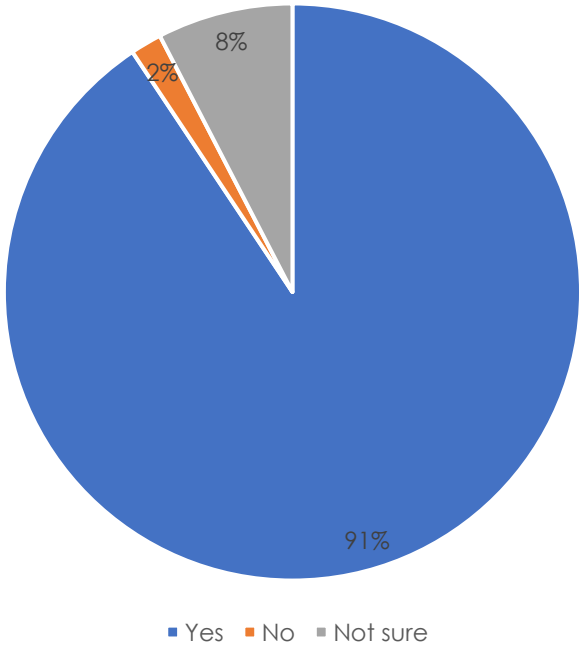


Figure 16: Teachers' views on whether schools should be able to bring multiple classes (n=171)

The majority of teachers also believe that schools should be able to bring more than one class to ESB Science Blast (91%, n=155). One teacher suggested in their feedback that there should be a maximum of two visits per class to maintain the 'wonder' of it all.

The dedicated day for Gaelscoileanna is highly valued and validates educational options and children's learning in Irish and Science

Feedback from children and teachers participating in the dedicated day for Gaelscoileanna through Irish was also analysed separately to understand any differences in the experience for them. Similar themes were highlighted to English speakers. Namely that it helped create enthusiasm for science.

'Ni maith liom eolaíocht ach is maith liom a bheith anseo' (Boy, age 11, Dublin)

It was a fun way for children to learn.

'Bhí mo mhála paiceálta don dhá seachtain'. (Boy, age 11, Dublin).

It supported them to develop both scientific and social skills and STEM aspirations for the future.

'It inspires kids like me to think big for the future'. (Child respondent)

It provided an opportunity for them to showcase their learning beyond their own school environment.

'Is maith liom go bhfuil daoine fásta anseo freisin'. (Boy, age 11, Dublin)

It provided them an opportunity to learn about other schools' projects.

'Taispeáin daoine cad a bhfuil muid ag déanamh agus faigh eolas ó na páistí eile' (Girl, age 9, Kildare)

Some children specifically highlighted how they appreciated the ability to do science through the Irish language and the fact the staff, judges, and other schools all spoke through Irish too.

'Is breá linn a bheith ag caint as Gaeilge inniú' (Girl, age 9, Kildare).

Several teachers interviewed highlighted appreciation for the dedicated day run through Irish. They felt it was important for normalising the language for students.

'That there is an outside objective for them to use their Irish language in such an important science-based project gives us great courage as a Gaelscoil'. (Teacher respondent)

They highlighted how Gaelscoileanna can be isolated from each other, and from other schools in their locality so the dedicated day given in this context was appreciated as an opportunity to connect and validate the educational environment and student learning.

'Gaelscoileanna can be quite isolated at events in their locality. They have to switch to English for events. Here my students realise that there are others outside of the school speaking Irish. This event we'll be able to refer back to again and again as a place where you

met other Irish speakers. It tells them that they're not just living mum and dad's dream of sneachta and cuilleoga'. (Teacher interviewee)

'An rud is fearr ná an Gaeilge a chloisesann tú'. (Teacher, Wexford)

'An rud is fearr ná na scileanna sóisialta… an muinineach atá acu a bheith ag caint le daoine eile - páistí eile agus múinteorí eile as Gaeilge. Níl aon deis eile a dhéanamh ach anois' (Teacher, Waterford)

The organisation of the event was excellent

Children (537) and teachers (107) responded to a question about suggestions for improvement of the event in the surveys. A large number of children (61% children, n=330) and many teachers (37%, n=40) took the opportunity to express gratitude for the opportunity to participate. Many of these respondents remarked that they had no suggestions, and the showcase was "perfect" as it was. Specific recurring themes from children responding to this question were:

- how much fun they had at the showcase experience (19%, n=100).
- how grateful they were to the organisers, and their excitement to return in the future (4%, n=21).
- how it was a great learning experience for them (8%, n=44).
- the pride they took from showcasing their work to others (6%, n=31).
- the pleasure they got from a day out of school with the freedom to explore the showcase with their friends (5%, n=27).
- their enjoyment of particular stands and performances. Several children specifically. highlighted Mark the Science Guy and the Leinster Rugby stand (5%, n=26).
- their enjoyment of meeting new people, including teachers, children from other schools, judges, staff, and brand ambassadors (4%, n=19).

4.2.3 The virtual experience

Two teachers were interviewed on their experience of participating in ESB Science Blast virtually. Both highly valued the experience and the ability to participate remotely.

One described it as a very positive experience and that they would recommend to others, particularly highlighting the simple application process, the fact that the form doesn't take a long time to fill in, the lesson plans and videos as a support for preparing the investigation and selecting questions, the right level of support and communications coming from the RDS Foundation and the feedback from the judges.

'The judges were very child friendly – they asked simple questions. What did you enjoy the most? What might you do differently? What surprised you?' The feedback from the judges was also excellent – they gave a really detailed report under different headings etc. It helps you see what you do better'. (Teacher, virtual participant)

Another teacher appreciated the opportunity to do a science project, which they wouldn't have otherwise done. They found the guidelines for investigations, predictions, and fair testing helpful. They also found a video of ESB Science Blast on YouTube that was helpful for motivating the classroom. That said, they felt that the virtual experience lacked the excitement of bringing the children to the event and the opportunity to see what other schools are doing, and that the time lag between the investigation and judges' feedback, and the fact that the bag of goodies didn't arrive until after the judging meant that they felt a bit left behind and separate from the main experience. Their suggestion was that the virtual judging take place closer to the ESB Science Blast event itself and/or that there was more clarity on the timing of the virtual judging to enable the teacher to be able to move onto other areas of work.

4.2.4 Suggestions for improvement

Children (322) and teachers (77) provided a range of suggestions for improving the showcase event in their responses to open-ended survey questions. Key themes are synthesised below.

Teachers were also specifically asked about how inclusive they felt the event was and for suggestions as to how it might be made more accessible. A large proportion of teachers expressed satisfaction with the inclusivity of the event (79%, n=94), commending specific supports like the quiet room, the detailed schedule of activities for schools, and bilingual staff catering to Gaelscoil children on the dedicated day for Gaelscoileanna.

> *'It's great to see that science is accessible to everybody. It's good to see the children with additional needs feeling included and not feeling less able.' (Teacher, Special School)*

Children and teachers wanted more interactive activities, stands and shows.

Many children were enthusiastic about adding more activities to the day out and reducing the queues for the activities that were available (5%, n=25).

> *'I think it's really good but the queues to the stalls were really long'. (Boy, 5th Class, Gaelscoil)*

Similarly teachers suggested more activities to keep the children entertained would be helpful whether that is stalls, presentations from external organisations, shows or more organised activities that would facilitate children speaking to other children from different schools, e.g. treasure hunts or guided feedback templates for children (25%, n=27).

> *'I would have liked to see more science activities - my class said some of the activities available were very busy and spent a lot of time queuing'. (Teacher respondent)*

> *'More activities for the children to enjoy. There seemed to be more for them to do in 2020 compared to now.' (Teacher, Wicklow).*

> *'Maybe more shows, the circus scientists were excellent, more events like that'. (Teacher, Dublin, DEIS School).*

'If there was a treasure hunt form which encouraged children to gather one answer from at least ten other schools, this would encourage them to listen to the other schools' presentations.' (Teacher respondent)

Some hoped for more schools and a greater variety of projects

Some teachers requested more school stands and a larger number of participating schools (15%, n=16). One child also hoped for more variety in projects.

Some requested greater adaptations to avoid sensory overload

While it is acknowledged that there is a quiet room available, a small minority of children (2%, n=9) and teachers (12%, n=14) commented that more could be done to support children with autism. Several children highlighted noise and crowds as an issue in the survey and in interviews, commenting that they felt overwhelmed or acknowledged the sensory overload experienced by some of their classmates and suggested that this could be improved.

'More variety of projects and food, and less crowded'. (Girl, 3rd Class).

One girl suggested some changes to the layout.

'I think the area should be arranged by class or age but other than that I loved it'. (Girl, 4th Class).

Some teachers commented that the quiet room was too far away from the main area which made it difficult to access if a child was in the middle of experiencing an episode of challenging behaviour and also impacted children's ability to then interact with the judges. They pointed out the lack of a sensory room where children could still interact with some form of scientific stimulation rather than a complete absence of sensory triggers. Some responses also mentioned that:

'While the quiet room was a nice space for some of our children, the inclusion of more sensory-based items such as beanbags, Squishy toys etc would help. Also, a better system of monitoring children in there as some were left unattended and loud which was causing upset for children who needed it more.' (Teacher, Dublin)

'The sensory room should be located on the main floor. The room provided was too far for dysregulated children to get to in the middle of an episode of overwhelm.' (Teacher, Dublin)

At the end of the day, one child with autism asked her parent:

'Why does Science Blast hate autism?' (Girl, 3rd class, Dublin)

A few teachers found their pupils overwhelmed with the highly stimulative environment at the showcase and requested that more efforts be undertaken to support children with sensory needs and accessibility challenges. Suggestions for greater accessibility for autistic children included providing a space at the edge of rows for any performances in case it got too loud, so movement was easier, a livestream option to the shows in the quiet room, an ability to skip queues with accessibility cards, or a time in the schedule specifically for neurodivergent children. This was highlighted by a few teachers in interviews also.

'An autism-friendly day could be helpful – a quieter day for kids with sensory issues (lots of clapping and screaming during the main day)'. (Teacher, Dublin 5)

The cost of food could be brought down to make this more accessible

Several children felt that the food was too highly priced and inaccessible to many children and commented on the quality of the food provided (4%, n=19).

'Maybe put down the prices for food because a lot of kids forgot their lunch and don't have enough money'. (Boy, 3rd Class, Wicklow)

'The food should cost 5 cent.' (Girl, 6th class, Kilkenny)

Several teachers also highlighted that the children were disappointed by the high cost of the food stands available at the showcase, making them inaccessible to some children highlighting socio-economic differences among them (4%, n=5). Some had instructed them to bring the same amount (e.g. five euro) to ensure equality among students, but then found they were unable to buy anything substantial with that amount.

'I know this may be out of your remit but the cost of food/snacks etc was extremely expensive'. (Teacher, Roscommon)

'The only issue I have with the day (and I said it last year too) is the price of the food. These are primary school children and a spice bag (€7.50) a crepe (€9) and a 3- in-1 (€14) is exorbitant and wrong. I know this service is delegated to food companies, but I find it unfair that popcorn is €5 for 12-year-old children. The children agree with me.' (Teacher, Meath)

Three teachers (two via survey, one via interview) also requested healthier food options.

Travel costs and distance presented issues for some

A few children interviewed spoke of the long day involved when travelling from more rural locations.

'If it was a bit closer maybe, we had to get up really early'. (Girl, 5th Class, Wexford)

One child highlighted the cost of transport as a barrier for them the previous year.

'We did all the work last year and made a project and everything but our school didn't have enough money for a bus so we couldn't go'. (Girl, 6th Class, Dublin)

Some teachers referenced travel costs and travel-related difficulties such as not having enough specific directions (e.g. SAT-NAV code) and getting lost and getting up early.

The timing and quality of judges' feedback wasn't consistent across all projects

Several teachers highlighted challenges related to the timing of the arrival of the judges at the stands at different points, making it difficult for them to know when the children needed to be there rather than exploring, and a lot of waiting around for the children (3%, n=3).

'I would like to see the judges giving the school a time that they will be at the project so that it's easy to arrange to have all children there at a certain time. We found it difficult not knowing when the judge would arrive, and it limited the children's time for exploring the other exhibits.' (Teacher, Wicklow)

Others had concerns about the quality of the judges' feedback (9%, n=10). One highlighted that their judge needed more confidence in talking to children, e.g. follow-up questions that they could ask the children rather than asking only the same questions. One felt the feedback given was over-generalised and not project-specific enough and requested that in future.

'I felt this year that the feedback/engagement was generic, and a bit copy and paste. The 3rd/4th class judge told us we would have to wait till after 2pm for the trophy/feedback because the judges would only get the trophies at 2. Clearly not the case when we received our feedback and trophy from the other judge at 1:15 pm. He subsequently gave us another school's feedback. If the quality of judge is not maintained, the loss of integrity will devalue the experience.' (Teacher, Dublin)

'I enjoyed getting the feedback from the judge, but I would have liked a written copy of her evaluation. It would be good feedback for the school and class.' (Teacher, Wicklow)

Teachers would like to see more learning opportunities and resources for teachers

Several teachers requested learning opportunities and useful resources for teachers at the showcase (8%, n=9).

'Maybe a little teacher education. E.g. practical teaching ideas on one topic per annum. Teachers might go away with some ideas on e.g. fun stem ideas to teach levers or electricity etc. Many primary teachers will not have done chemistry or physics at LC level. It seems that we all spend a lot of time researching the same lessons.' (Teacher, Wicklow)

'Extra adult stands for teachers that promote integrating the teaching and learning of STEM subjects.' (Teacher, Dublin)

'Teacher freebies and supports.' (Teacher, Carlow)

A few also requested more seating in the hall and opportunities to leave the stand for a break (2%, n=3).

'Tea and coffee area for teachers closed at 1pm and I didn't get a chance to get over to it'. (Teacher, Carlow)

'More seating in the display areas - we found ourselves either standing a lot, or retreating to the Teacher's areas to sit - which meant we were separated from the students.' (Teacher, Dublin)

During interviews, several teachers (especially first-time participants) also suggested more guidance for teachers in preparing their stands would be helpful.

'I'd encourage other teachers to think about props like suits/sensory elements that you can incorporate that make it interesting for others to see - what can people smell/taste/touch? Otherwise, it can all be a bit the same.' (Teacher, Galway)

More time to do their investigation

Several children described not having enough time to do their investigation. This appeared to be related to the timing of when they started the investigation or the arrival of the materials that they needed or having a short period in class to dedicate to it.

'More time to do it, all the equipment was expensive & had to learn how to use it.' (Girl, 5th Class, Wicklow)

Minor themes

Minor themes which were raised by less than five people included:

- More diversity in representation (n=2): One teacher suggested that their own school was one of the more diverse represented and another suggested that more effort could have been made in the selection of children chosen to join performers on stage.

  'I noted that at the show six children were chosen and all six were white. In a room full of diverse backgrounds and colours, I found this strange.' (Teacher, Mayo)

- More language diversity (n=3): A few suggestions related to having a multi-lingual day or multi-lingual signage, e.g. encouraging schools to present their findings in different languages.

- Suggestions for virtual ESB Science Blast (n=2). Both virtual participants thought that the virtual option could be advertised more as it might help some schools to participate who otherwise might not, based on the location of the showcase events. One suggested that a prize for virtual participants could be a nice way to create a bit of 'buzz' around the virtual experience or that vouchers for science equipment could also help.

4.2.5 Maintaining and sustaining the excitement generated by ESB Science Blast

Children (n=563) and teachers (n=126) provided suggestions about what would help to maintain interest and excitement in STEM among children in future in their survey responses. The most common recurring themes highlighted by both groups were interactive learning methods and resources to improve STEM lessons in school and participating at a similar event in future. These are elaborated further below, along with some minor themes.

More hands-on experiments and interactive learning and projects

The most common response among children (36% children, n=200) was a desire to conduct more hands-on experiments in class and more projects where they were actively involved. They highlighted

that more experiments and investigations would help them grow and improve STEM skills and become scientists in the future.

'Tá mé ag iarraidh níos mó eolaíocht a dhéanamh sa rang'. (Boy, 3rd Class, Dublin)

Many highlighted how interactive group work and collaborative work with their teacher would help them to continue to enjoy STEM, rather than going back to their old ways of working (7%, n=40).

'Ag déanamh níos mó tionscioneamh cosúil leis an cheann seo'. (Girl, 3rd class, Gaelscoil)

Many children highlighted their excitement for doing more STEM in future having had so much fun participating in ESB Science Blast this time around (12%, n=67).

'The science tricks are very fun, learning new things that amaze me'. (Boy respondent).

Teachers also highlighted how hands-on experiments, interactive group work and child-led learning methods would increase student engagement in STEM.

'Reversing the roles and having the kids ask the questions is important. They come away asking even more questions from it and we talk about it afterwards'. (Teacher, Meath)

They highlighted that enabling children to relate their learning to the outside world and investigate questions with real-word, practical applicability was important (31%, n=39).

'Experiments and more experiments. The children love carrying out experiments by themselves and adapting them to see if they produce different results. Maybe a visit from a Science Blast official to explain in person what the process and day involves would encourage more STEM to take place in the classroom!' (Teacher, Longford, DEIS School).

Attending ESB Science Blast or a similar event again

The idea of attending ESB Science Blast again or going to a similar event in the future was the second-most significant theme among children's responses (18% children, n=100).

'It would be exciting to do more like these events to actually go out and make something.' (Boy, 4th Class)

Many teachers (39% teachers, n=49) felt that the prospect of attending a similar event would be enough to maintain excitement around STEM. Several teachers mentioned how the children were already asking to return next year while they were at the showcase.

'My class this year have already asked if they can do it again next year. I don't think they need much encouragement'. (Teacher, Gaelscoil, Monaghan)

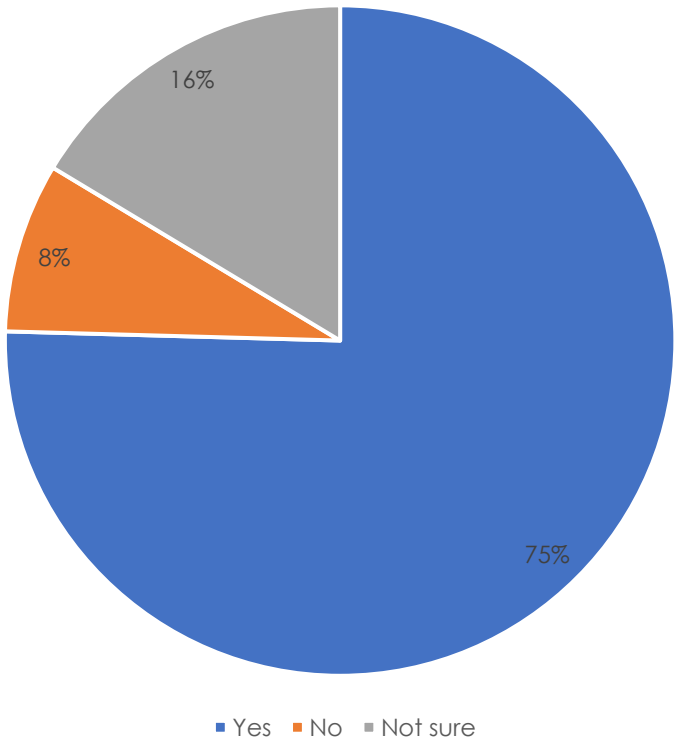


Figure 17: Teachers' views on whether children should be able to participate more than once (n=171)

When asked whether they thought children should be able to participate in Science Blast more than once, the majority felt that they should be able to (75%, n=129).

Learning more about technology and being able to design and create (6%, n=33)

Some children highlighted their interest in learning more about technology, inventions, computer coding, and robotics, often highlighting their desire for more opportunities to create their own technology and become "inventors".

'So cool I could try and make robots' (Boy, 4th class)

'If we had new iPads we would be excited about learning STEM on different websites.' (Girl, 6th Class, Dublin)

'Designing new technology.' (Boy, 5th Class)

More resources in the school

Some children (3%, n=14) and many teachers (21%, n=27) expressed a desire for additional resources to support them in the STEM work at school. A few children talked about resources which would make future experiments easier to do more frequently. These included science equipment like beakers, test tubes, thermometers etc., as well as more frequent access to their school sports hall to carry out large experiments and to their school computer room for research.

Teachers also felt that the addition of resources would help keep their pupils enthusiastic about the subject.

'More funding for STEM resources so we could participate in more STEM activities.' (Teacher, Gaelscoil, DEIS School, Cavan)

More support for teachers

Several teachers (6%, n=7) highlighted that extra teaching support would help them boost classroom engagement in STEM, specifically extra webinars, training, and information on how to implement STEM into their classroom to improve their ability to maintain children's STEM interests.

'Videos for the class to watch that showed ideas and examples of inquiry-based learning would have helped us as it was our first year.' (Teacher, Laois)

'Lesson plans and webinars would certainly be helpful. Videos of teachers teaching various STEM activities.' (Teacher, Dublin)

'Lesson plans on the more difficult-to-teach areas of STEM such as materials/change etc... Also, lesson plans aimed at schools with low resources available for STEM due to poor funding.' (Teacher, Dublin)

Negative feedback

It is worth noting that responses were not universally positive among children. A small minority highlighted that "nothing" could be done to make them excited to learn STEM, or that they had no interest in this in the future (6% children, n=31). Two children interviewed from Gaelscoileanna spoke about how they didn't feel that science was for them because it was for clever people:

'Nil me ag iarraidh a bheith eolioacht mar níl mé cliste'. (Boy, aged 11, Gaelscoil, Dublin)

'I'm not really bright in science but I am in Maths.' (Girl, aged 11, Gaelscoil, Cork)

4.2.6 Challenges and supports for teachers

Teachers were asked to rank what the most challenging part of ESB Science Blast was for them (one being the most challenging and six being the least challenging). Over two-thirds of teachers rated letting the children decide what would be investigated as the most challenging aspect of the whole process (42%, n=73). Almost half of respondents deemed the showcase event itself the least challenging element of ESB Science Blast (46%, n=79).

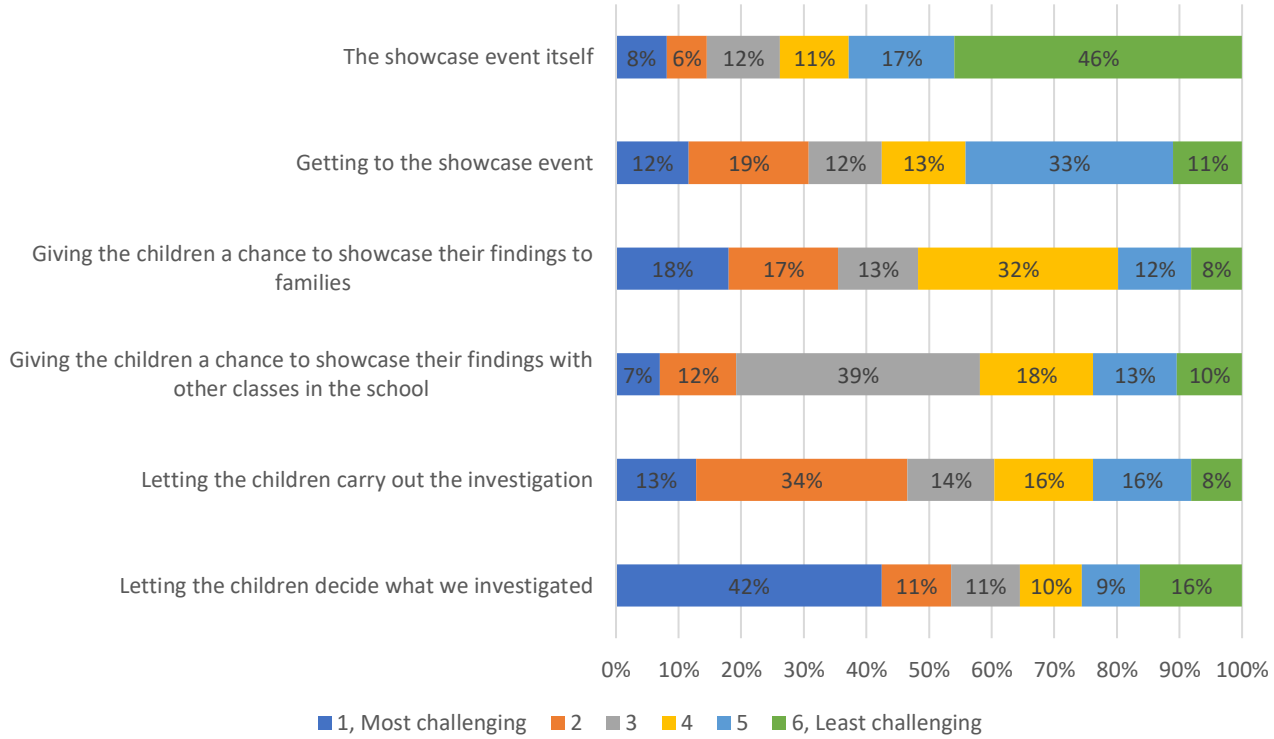


Figure 18: Teachers' views on the most challenging aspects of the programme (n=172)

Teachers also ranked from one to eight what extra supports would help them participate in ESB Science Blast in the future. The most highly ranked support was continued professional development on inquiry-based learning (49%, n=83).

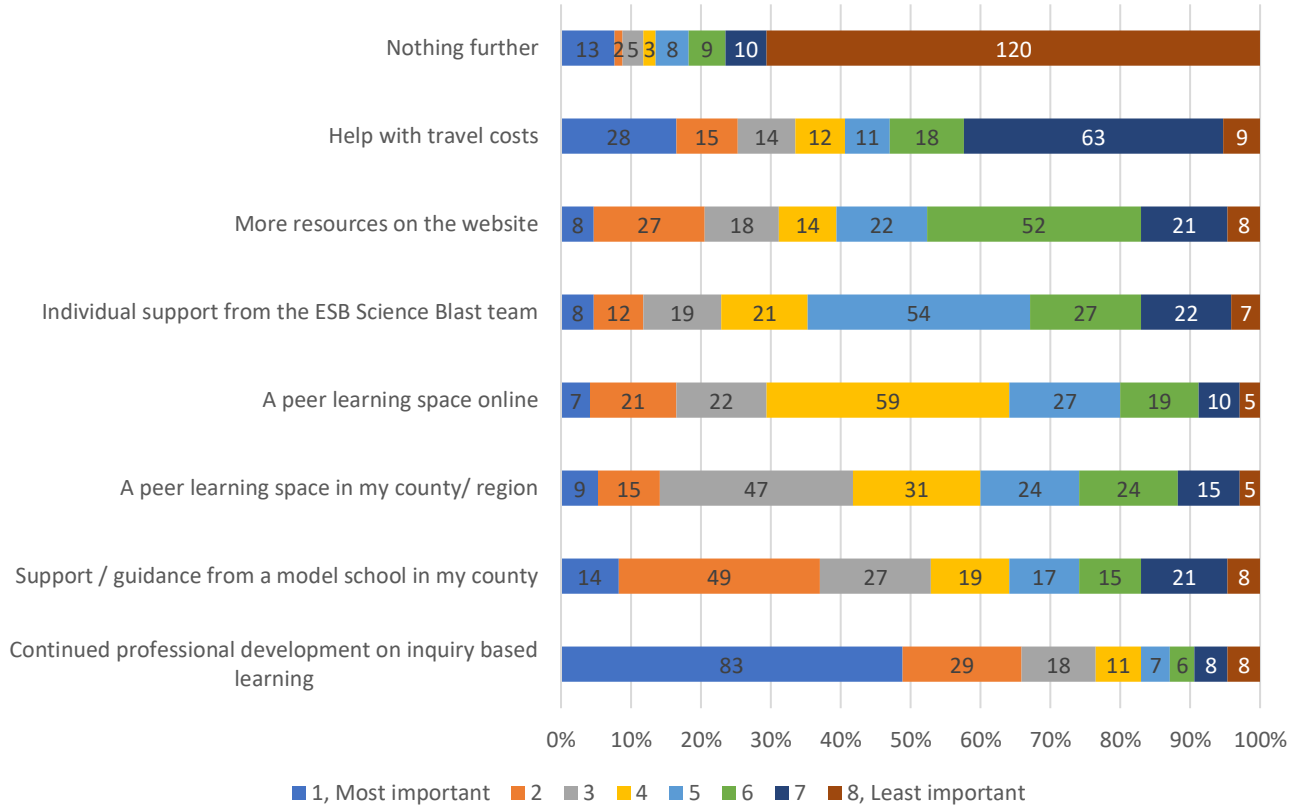


Figure 19: Teachers' views on supports that would aid participation (n=170)

Teachers elaborated further on what resources would help them get the most out of ESB Science Blast in an open-ended question. Many complimented the existing resources, while others made additional suggestions for what could help them:

Lesson plans, webinars, and other online resources

Many teachers suggested that lesson plans (n=39), webinars (n=26) and video resources (n=34) would be helpful to them, both to orientate them to the programme, as well as support them with specific aspects of it. One suggested that webinars earlier in the process would be helpful. Specific topics of interest were:

- **Guidance on how to approach an investigation:** Teachers sought more 'how to' guidance' for investigations (n=20). For example, when to pick a question, where to start with picking a topic and how to generate ideas for science questions, how to support children to create a method when they have decided on a question, how to present it, top tips on science skills and introduction to scientific language, etc. Teachers requested more guidance in supporting inquiry-based learning (n=13). There were also a few requests for ideas for where to source materials and resources that help teach science in an interactive way in school and ideas or lesson plans for schools with low STEM resources available.

- **Supporting STEM skills and integration across the curriculum (n=20):** Several teachers requested more support in specific areas: survey design and analysis (n=6), integrating maths (n=4), presentation of findings in charts and graphs (including how much data to include in the project) (n=4), more curriculum-based resources and lessons tying into each strand of the science curriculum (n=2), experiments and investigations. Two teachers suggested videos of teachers teaching STEM activities would be helpful to them. Several teachers (n=5) requested more resources and signposting of useful resources on STEM teaching – e.g. learning about forces, difficult to teach areas of STEM such as materials/change, and a scheme (i.e. a long-term plan which supports teachers with teaching and learning over a period, and includes lesson plans, links to curriculum, etc.).

- **Sample investigations and previous projects:** Many teachers sought more examples of previous projects to guide them through the process from start to finish (n=23) – e.g. a demonstration from a school of what each stage involved and/or interviews with children and teachers about how they went about it. They felt this would help teachers by providing inspiration and make it less daunting.

- **More orientation on the showcase event or judging process**: Several teachers highlighted that further orientation on the showcase event would be useful (n=6). For example, a video walk through the showcase to give an idea of what it looks like, as well as guidance on the best way to display information in the space given, what content should be showcased, or what might be helpful to bring with them, to give them a sense of what is expected of them. One virtual participant highlighted that more guidance on how to approach the presentation for judges for the virtual option would have been useful.

- **Webinars for children**. Several teachers suggested that webinars or videos aimed at children would be useful in the lead up to ESB Science Blast to provide inspiration and excitement (n=5). These could be short videos outlining the stages of the process, showing different kinds of scientists, or having a webchat with a scientist in the planning stages of the project. One teacher recommended a 'Meet the Scientists' webinar as an early introduction to how science is all around which helps children think about different types of scientists ahead of the event.

- **More Irish language resources** Many teachers complimented the existing bilingual resources and requested more of these (n=5).

Support is needed for science equipment and travel to enable full participation

Several responses (n=7) highlighted the need for material and financial support for some schools to be able to participate. One school requested additional support for bus travel. Others requested either resources or equipment to carry out experiments, e.g. measuring equipment, or materials to support chemistry projects where this is what the students had chosen. Suggestions were that this could be

provided directly, or through funding support, or through links to companies who might donate equipment.

> *'The STEM grant of 10,000 was not pro rata & some schools got some and some got none. All schools should be entitled to something.' (Teacher, Galway)*

Minor themes

Other suggestions made by teachers to support their participation in the programme made by fewer than five teachers included:

- **Visits / video calls with judges / scientists ahead of the showcase**. A few responses suggested a visit from a scientist, or for ESB Science Blast to come into the school to speak about the project would be helpful ahead of the showcase (n=3). One highlighted how useful the video call with a judge ahead of the event last year was.

- **A summer course or training day for teachers**. Two teachers specifically requested training days.

- **A school trip option to engage younger students**. One teacher proposed opening the event to younger age groups to attend as a school trip if desired.

- **A Science Blast Padlet:** one teacher suggested that a padlet could be useful for referring to things as they arise.

4.3 Key informant perspectives on ESB Science Blast

Eight key informants gave their perspectives on the value and potential of ESB Science Blast during interviews. Themes raised by more than two informants are outlined below.

4.3.1 It supports children to build key skills

The focus on building skills in research, critical thinking, collaboration, and communication was highlighted as important. One key informant felt the biggest impact was in helping children to be analytical, logical, and questioning, and developing these skills early in their education. Another outcome was that children started to see themselves as people who 'do science'. Another key informant highlighted how building children's confidence to ask questions and find answers from an early age was important for shaping how positively they engage with science in secondary school. This learning approach is continued at secondary school where the new classroom-based assessments for science allows students to choose something that they are genuinely interested in for further exploration, so developing these skills in primary gives young people a head start. Another key informant highlighted how important this integrated learning was in Northern Ireland where education policy promotes a huge degree of specialism at an early age in secondary education.

4.3.2 It supports teachers to teach in an integrated way

Teachers face challenges of having a huge amount of material to cover and not enough time to do it. A key value of ESB Science Blast highlighted by key informants is its ability to integrate multiple subjects, offering cross-curriculum learning for children and timesaving for teachers.

> *'Science Blast is the most effective integration of science and other subjects. It is one of the best initiatives because it's not seen as something extra. It allows you to delve into it'.*
> *(Key Informant 1)*

ESB Science Blast allows teachers to explore not just a science question, but to build core skills early on because it is about a team of children working together, learning how to communicate with each other as well as with adults. Another point raised was that the simple structure and tools for teachers made it easy for teachers to engage.

4.3.3 It provides recognition and acknowledgement to both teachers and students in a non-competitive way

When teachers are faced with competing demands and pressures in the classroom, key informants highlighted that recognition and acknowledgement for work done is helpful for maintaining motivation. A strength of the programme was that every child participating in ESB Science Blast leaves having achieved something, and that teachers and students have the experience of showcasing their work, which provides connection and motivation towards studying science.

The non-competitive element was highlighted as important for encouraging participation and diversity as children from any background can take part, to whatever level the teacher determines appropriate, without a fear of being exposed. This distinguishes the programme from other competitive science competitions which focus on individual effort and may favour children from families who are more resourced.

4.3.4 It is inclusive

By bringing together children from different backgrounds to share their findings, the program provides an opportunity to break down gender perceptions of science and bring in children from backgrounds who wouldn't otherwise perceive themselves as having a STEM career. Several key informants highlighted its value in supporting the participation of communities who might be significantly disenfranchised. An excellent example of this is that the participation of special schools (i.e. schools which provide education to children with complex special educational needs) has helped parents realise that science careers are not off-limits for their children. Removing the ceiling from an early age has potential to affect a child's future idea of themselves and their potential.
The Gaelscoil day was also welcomed by multiple interviewees as unique in its offering to students from Gaelscoileanna to use their voice in the medium that they want to and be respected for that.

'The Gaelscoileanna day has been really successful as they're often excluded from big English-speaking initiatives. There is a longer-term impact of giving schools a space to create connections between them.' (Key Informant 8)

4.3.5 It promotes children's participation and children's voices

A few key informants pointed to the importance of children's participation in the investigations fostering enthusiasm and curiosity. One key informant highlighted that the programme takes a child rights approach without necessarily having been designed that way by encouraging children to design, lead and communicate the findings of their investigation.

'You can tell from the outset where the child's voice has been honoured. Often the best learning and engagement of children has come from that. You see it in abundance at Science Blast, 99% of the time the teachers take a step back, honour the child's voice and let them decide where their interests and energy lie. Many teachers want to take a child rights-based approach to education – Science Blast allows them to do it.' (Key Informant 1)

At the in-person showcase, they also get to learn about the questions that other schools are exploring and see other children investigating questions, increasing their enthusiasm and excitement for future learning.

4.3.6 The showcase events have an energy and buzz creating enthusiasm for science early on

By involving children in science investigations at an early age and having the 'hype' and 'excitement' and 'occasion' of an in-person showcase event, interviewees highlighted the enthusiasm and motivation for science apparent among children early on. Many highlighted the enormous appetite there was for STEM initiatives early on which might otherwise go untapped.

'So many children were so excited about it. You know when the children were involved from the beginning because they were so excited about the process.' (Key Informant 9)

'You come, you can be you, children lead the investigation, children from any walk of life can join, children can participate in the language they want to, they are given awards & recognition. All these informal interactions in the build-up to the event and at the event matter but are harder to quantify.' (Key informant 1)

A key value of Science Blast is the in-person showcase where children get to learn about the questions that other schools are exploring and see other children investigating questions.' (Key Informant 3)

'Its uniqueness is also in supporting schools to come together to make connections and learn from each other. That encourages more schools to be involved.' (Key Informant 8)

'The in-person showcase element is really important because for the kids it's about them being outside the school environment, showcasing their work, etc.' (Key Informant 8)

'Teachers are also able to learn from each other & build up communities of practice. To date collaboration & sharing of resources between teachers hasn't been part of the culture. Finding ways of doing this is important. There wouldn't be the same draw without the in-person showcase.' (Key informant 8)

The importance of ESB Science Blast as an initiative which sparks curiosity among students for pursuing STEM subjects was considered a key strength of the programme. Its ability to do this by offering something exciting and different to normal class-based learning was highlighted. Complementary initiatives which could help to maintain and sustain the excitement included visits to the science museum, and visits from young people or professionals working in science into the classroom.

Another key informant highlighted that by fostering enthusiasm and assuming capacity, a more supportive environment is created for students to be able to thrive in science, and that often expectations need to be set higher for children coming into post-primary. The benefit highlighted for society and industry is more rounded professionals and a more rounded education system that can meet the challenges of the 21st century.

5 Outcomes

5.1 Introduction

This section outlines outcomes for children, teachers and schools reported by ESB Science Blast participants. It is based on children's own assessment of changes in their confidence in various skills, as well as teachers' assessment of outcomes for themselves and their schools based on survey results. It also includes illustrative quotes from in-person interviews with children and teachers, as well as online interviews with virtual participants.

5.2 Outcomes for Children

The programme seeks to support children to develop key scientific and life skills, as well as to increase their STEM aspirations. Outcomes are described below.

5.2.1 Children at the RDS showcase reported greater confidence in key skills

Children were asked to rate their confidence in various skills that ESB Science Blast aims to improve from less confident to more confident. Most children reported greater confidence across all areas. This included: giving their opinion in class, working as a team with classmates, presenting to and answering questions from an adult they don't know, solving problems, carrying out an investigation and putting results together, and attending a big event like the RDS showcase. The one area where only a minority (albeit substantial – 44%, n=286) reported greater confidence was in asking questions that they don't have the answers to. This is also the area where they were most likely to report feeling less confident following ESB Science Blast (14%, n=92). Children reported the biggest improvements in confidence in working as a team with their class (71%, n=466), attending a big event like the RDS showcase (66%, n=433), and in developing the scientific skills to carry out an investigation and put results together (64%, n=421).

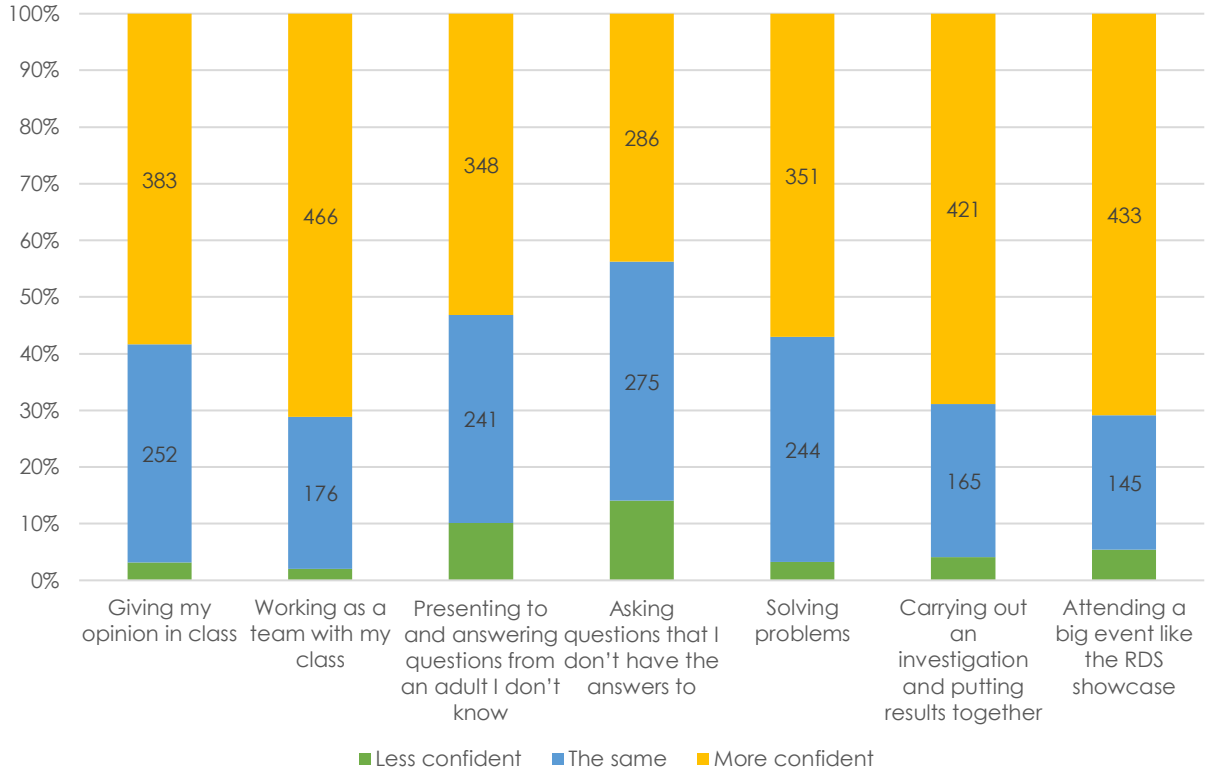


Figure 20: Children's confidence in key skills (n=655)

Children's responses regarding confidence in key skills were disaggregated by gender and by school class to investigate gender and age differences in each skill. No significant (+10%) gender differences were found in any of the named skills between girls and boys. However, the small sample of non-binary children (n=11) were much less likely to report increased confidence in communications and social skills following participation in ESB Science Blast, in particular working as a team (55%, n=6), asking questions that they don't have the answers to (10%, n=1), and presenting to and answering questions from an adult they don't know (36%, n=4).

As for differences by class group, no significant (+10%) differences were found in relation to giving their opinion, working as a team, or solving problems. However, some differences were notable between age groups when it came to presenting to and answering questions from an adult they don't know and asking questions they don't have the answers to, suggesting greater impact on older children. Sixth class children were much more likely to report being more confident presenting to and answering questions from an adult they don't know (63% as compared to 49-50%). Fifth and sixth class children were more likely to report being more confident asking questions they didn't have the answers to compared to third class and fourth class (46% and 51% as compared to 34% and 33% respectively). As for confidence in carrying out an investigation, results were more mixed – fifth and third class reported the highest levels of confidence (79% and 78% respectively) compared to lower levels among sixth class and fourth-class students (67% and 54% respectively). Fifth class students reported the biggest changes in relation to their confidence attending a big event like the RDS showcase (79%) compared to other classes (72% for third class, 67% for sixth class and 54% for fourth class).

Children's responses were also disaggregated by parents' background (whether born in Ireland or abroad or both) and by parental STEM career to assess any differences. The only significant difference (+10%) by parental background was that children from immigrant families were less likely to report greater confidence in presenting to and answering questions from an adult they don't know as compared to children from families with Irish-born parents (40% as compared to 58%). As for differences based on whether a parent worked in a STEM job or not, some differences were found. Children with parents working in a STEM field were more likely to report greater confidence across all key skills following participation in ESB Science Blast. The biggest differences were notable in teamwork (79% as compared to 66%), asking questions that they don't have the answers to (52% as compared to 36%), and problem-solving (65% as compared to 52%). These findings may indicate a need to provide guidance for teachers on inclusion to ensure that ESB Science Blast does not inadvertently widen learning gaps between more privileged and more marginalised children.

Teachers were also asked to provide their opinions on whether ESB Science Blast improved their students' skills in different areas. A large majority of teachers reported improvements across all skills. The areas where teachers reported the most change for children was their ability to actively engage in their own learning (94%, n=169), working as a team (93%, n=168) and enthusiasm and excitement about science (93%, n=166).

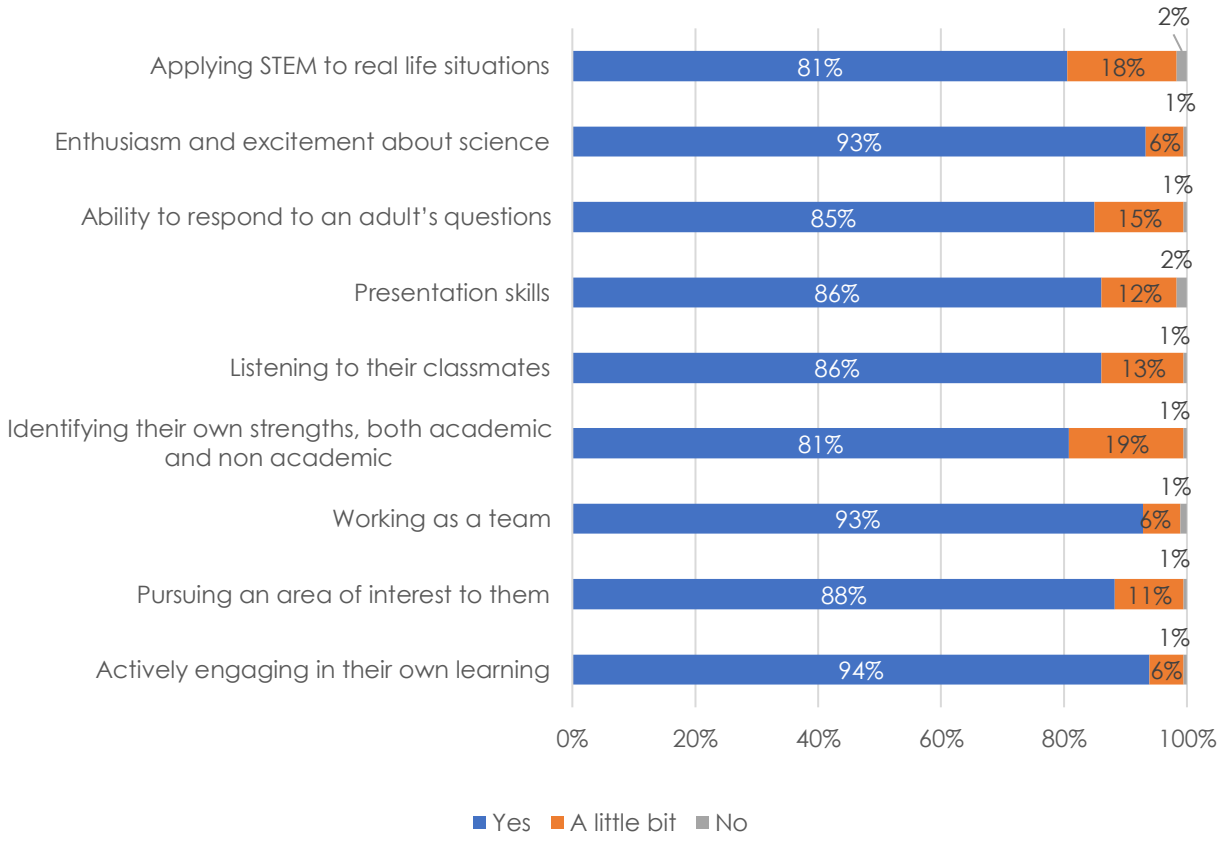


Figure 21: Teachers' views on whether ESB Science Blast helped their class with key skills (n=171)

'An tionchar mór na bíonn na pástí ag cur na ceist, bíonn siad ag obair mar foireann, tháinig siad suas le na smaoinnte (the interviewee switched to English) and that has increased their excitement levels in science - it also forces you to go past what you would usually expect of them because they want to go further.' (Teacher, Wicklow)

5.2.2 Children at the RDS showcase reported greater STEM aspirations

Children were asked if ESB Science Blast had any impact on their interest in working in a STEM job when they grew older. Two-thirds of children said they were more interested in working in a STEM job following participation in ESB Science Blast (67%). Of the remaining, 15% explained that they were already interested in a STEM job, 10% were not interested, and 8% were not sure.

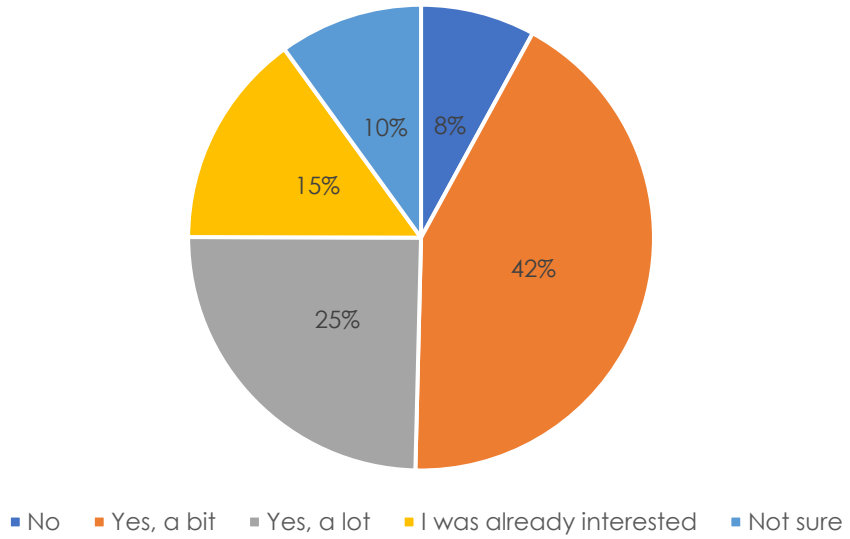


Figure 22: Children's views on whether ESB Science Blast made them more interested in a STEM job (n=641)

'I'm going to be a Scientist when I grow up. I was thinking of Fireman before' (Boy, 4th Class, Dublin)

'Everyone in our class wants to be a scientist when they grow up.' (Child respondent)

'I never really found Science that interesting but now I do.' (Girl, 5th Class, Wexford)

Responses were segmented based on gender, school class, type of school, parental birthplace, and parental career in STEM.

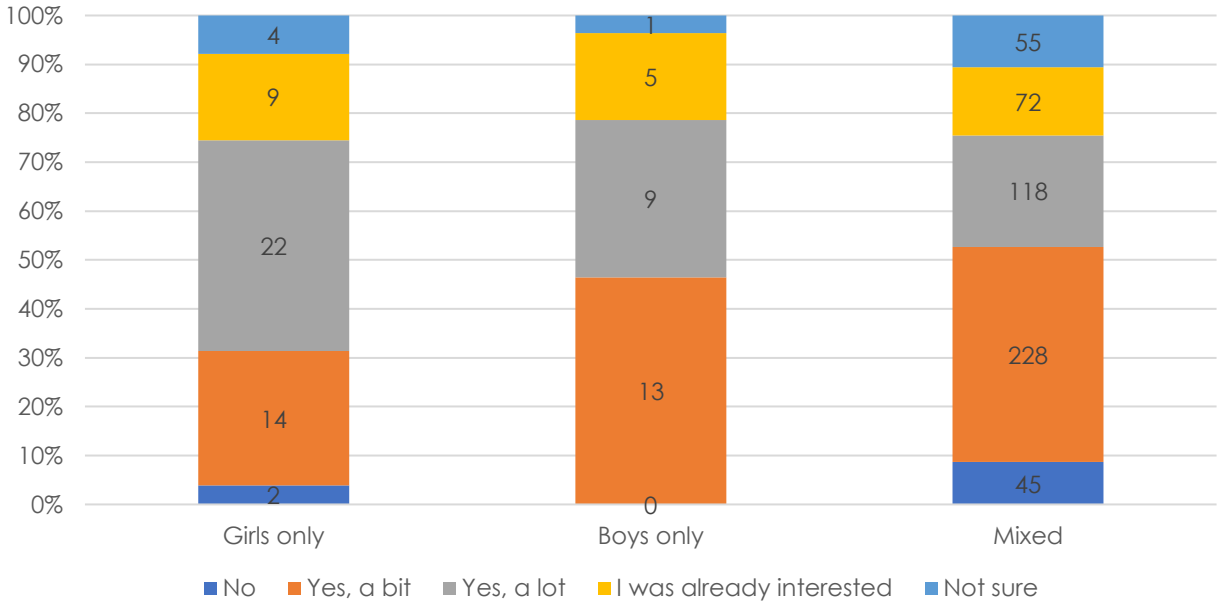


Figure 23: Interest in STEM career by school type (n=640)

While no significant (+10%) gender differences were found in interest in a STEM career following participation in ESB Science Blast, children from girls-only schools were most likely to say that ESB Science Blast made them a lot more interested in a STEM job (43%, n=22 as compared to 23%, n=118 in mixed schools).

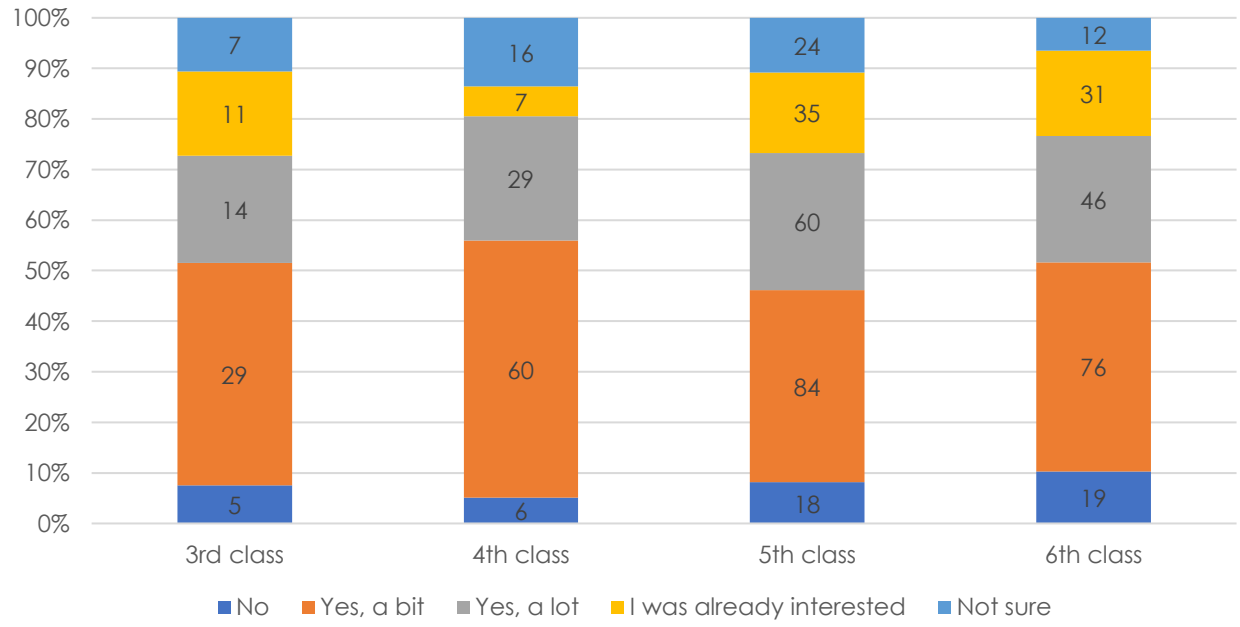


Figure 24: Interest in STEM career by class (n=640)

As for differences in age groups, children from 4th class were most likely to report more interest in a STEM career after participating in ESB Science Blast (75%, n=89 as compared to 65-66% for other classes).

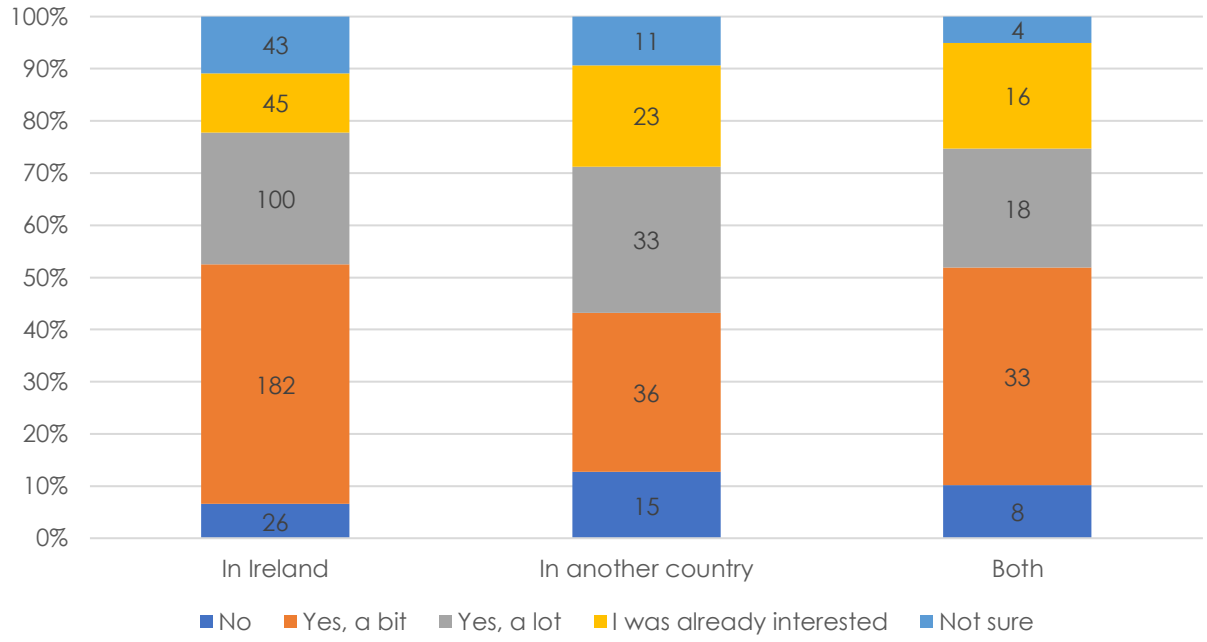


Figure 25: Interest in STEM career by parental birthplace (n=640)

Children with one or both parents born outside of Ireland were more likely to report a prior interest in a STEM career (20%, n=39) than children with solely Irish parents (11%, n=45) and as a result ESB Science Blast had less impact on their STEM career aspirations (71% of children with solely Irish parents reported

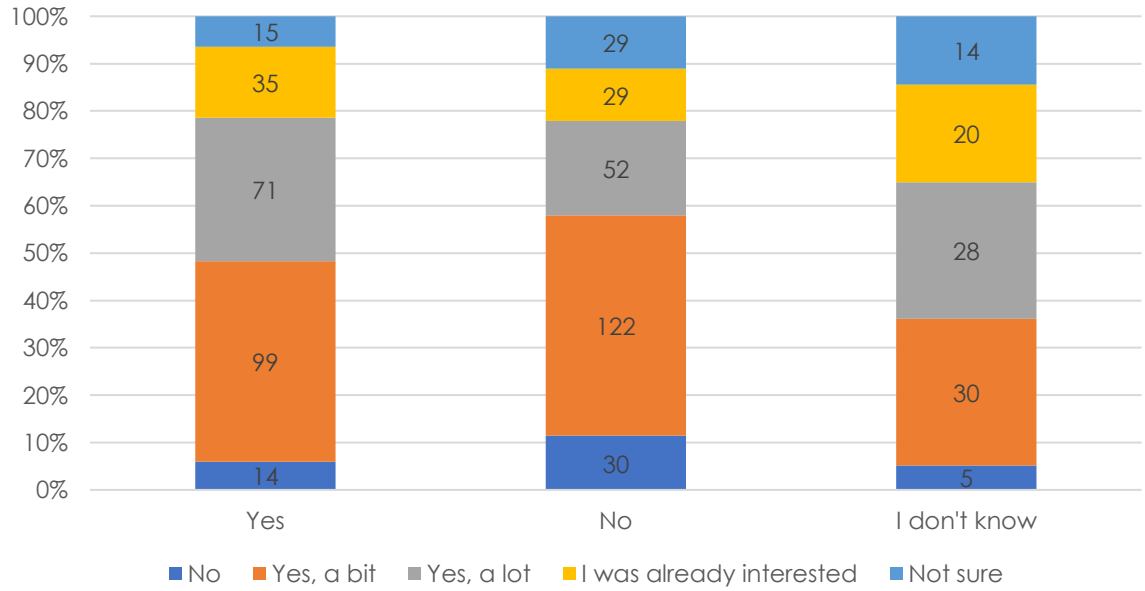


Figure 26: Interest in STEM career by parental STEM career (n=640)

being a bit or a lot more interested in a STEM job compared to 58% of those with parents born in another country).

A large proportion of children (39%) came from families where one parent worked in a STEM job. Those who didn't have a STEM connection were almost twice as likely to report that they had no interest in a STEM job (11%, n=30 as compared to 6%, n=14). Those with a STEM connection were much more likely to report that they were a lot more interested in a STEM job following ESB Science Blast (58% as compared to 20% and 29% of children whose parents didn't work in a STEM job or didn't know if they did). Children who perceived that they studied a lot of science in school were twice as likely to report that they were more interested in a STEM job following ESB Science Blast (34%, n=111 as compared to 17%, n=23 of those who perceived that they don't do much science in school and 13%, n=17 of those who didn't know).

Children who didn't know whether their parents worked in a STEM job were less likely to report being interested in a STEM job following ESB Science Blast. This could relate to them not knowing the diversity of jobs that could be encompassed by 'STEM jobs'.

Children were also asked how much interest they had in studying science and technology subjects at secondary school. A significant majority reported some interest in studying science and technology in secondary school (65%, n=412). Of the remaining children, 19% reported that they were already interested in studying STEM before ESB Science Blast, 7% were not interested, and 9% were not sure.

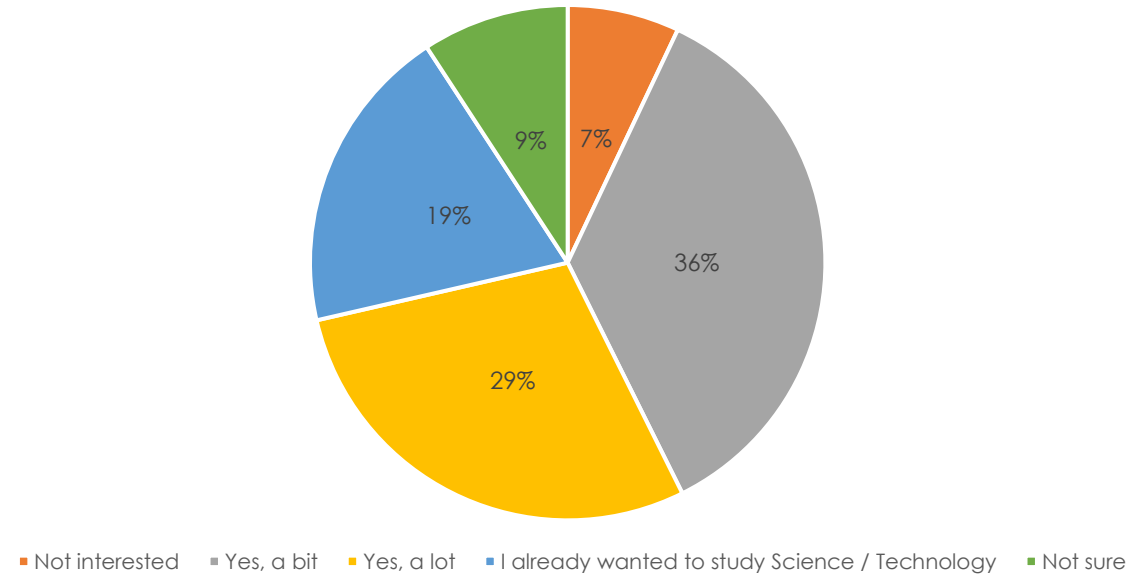


Figure 27: Interest in future STEM Study (n=640)

Responses were disaggregated based on gender, class, type of school, parental birthplace, parental career in STEM, and perceived amount of science studied at school to understand if children's interest in pursuing STEM subjects depended on different factors. Some differences were noted across categories:

- Girls were more likely to report being a bit or a lot interested in studying science or technology at secondary school than boys (67% girls as compared to 57% boys and 64% non-binary). However, boys (23%, n= 41) and non-binary children (36%, n= 4) were marginally more likely to report a prior interest in studying science and technology than girls (18%, n= 69).
- While there were no significant (+10%) differences between proportions of children interested in studying STEM subjects in secondary school by school type as a whole, there were some differences in levels of interest. Children in mixed schools were more likely to report being a bit more interested in future STEM study (38% in mixed schools versus 25% in girls only schools and 29% in boys only schools), whereas children in single sex schools were more likely to report being very interested in future STEM study (43% in girls only schools and 46% in boys only schools compared to 26% in mixed schools). The highest proportions of those reporting no interest in future STEM studies came from boys only schools (14% in boys only schools compared to 7% in mixed schools and 4% in girls only schools).
- There were no significant (+10%) differences between children with parents born in Ireland and abroad.
- While there were no significant (+10%) differences between proportions of children interested in studying STEM subjects in secondary school by class group, there were some differences in levels of interest. Children from third class were most likely to report being very interested in future STEM study (41% as compared to 23% in fourth class, 24% in fifth class and 33% in sixth class) and children from fourth class were most likely to report being a bit interested in future STEM study (46% compared to 26% in third class, 38% in fifth class and 30% in sixth class).
- There were no significant (+10%) differences in levels of interest as a whole by parental STEM job. However, as might be expected, those with a parent in a STEM career were most likely to report a prior interest in a STEM career (24% compared to 17% and 14% of those whose parents did not have a STEM career or did not know respectively) and least likely to report no interest at all (5% compared to 10% and 8% of those whose parents did not have a STEM career or did not know respectively).
- Children who perceived that they did a lot of science in school were most likely to report being very interested in studying STEM in future (35% as compared to 20% among those who felt they don't do much science and 21% who didn't know) and least likely to report no future interest (4% as compared to 14% of those who felt they don't do much science and 9% who didn't know).

5.2.3 Teachers of virtual ESB Science Blast reported positive outcomes too

Two teachers participating in ESB Science Blast virtually shared views on the impact it had on children. One highlighted the opportunity it afforded them to build their communications skills and teamwork skills as they worked in groups and quieter children were given an opportunity to speak up and build their confidence. They also highlighted the enjoyment that they took from experimenting and doing the investigation – which they wouldn't otherwise do - and presenting to other classes. Another saw shifts in their ability to think critically, collaborate with each other and be creative.

'It was great for supporting them with critical thinking. The children weren't just accepting one way of looking at things. They were being quite critical as they approached the investigation and when they were designing shoeboxes. It also helps them to think outside the box'. (Teacher, virtual participant)

They also highlighted that it supported a positive attitude towards science:

'I have to do it now because they love it. They ask me are we going to do science today? Will we do Science Blast? What are we going to do it on? What question? What topic? They got very into electricity. We did a load on it. We're doing more and more on the back of Science Blast now: making new things like fishing games with magnetism, making board games, etc. If I hadn't got involved in Science Blast, I probably wouldn't have done it.' (Teacher, virtual participant)

It was also highlighted that this positive attitude towards science might have an impact on their STEM aspirations.

'It wouldn't surprise me if it did inspire them to become electrical engineers – when I say science they say they love it. Having a fun experience inspires them. They love working in groups together – this allowed them to do that'.

5.3 Outcomes for Teachers

Teachers responded to survey questions regarding the outcomes of ESB Science Blast for them. A large majority of teachers responded that ESB Science Blast helped them support their class to develop different STEM skills.

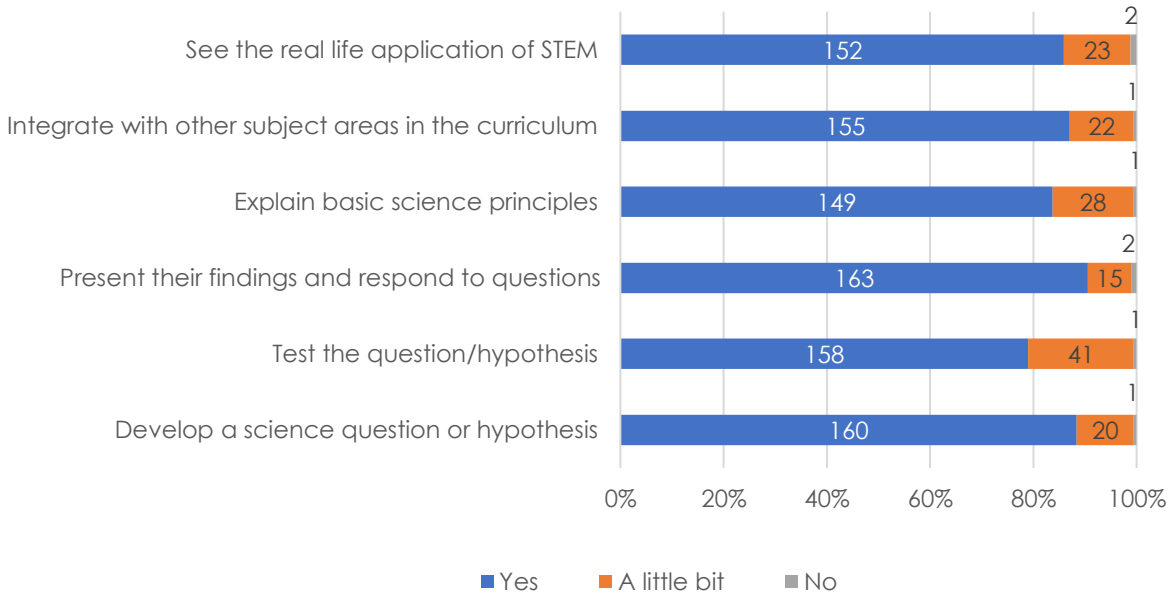


Figure 28: Teachers views on how ESB Science Blast helped them to support their class (n=182)

Similarly, teachers were asked to report if they felt more, less or the same in their levels of skill and confidence in teaching STEM, integration, and inquiry-based learning. Most respondents felt more confident across all skills.

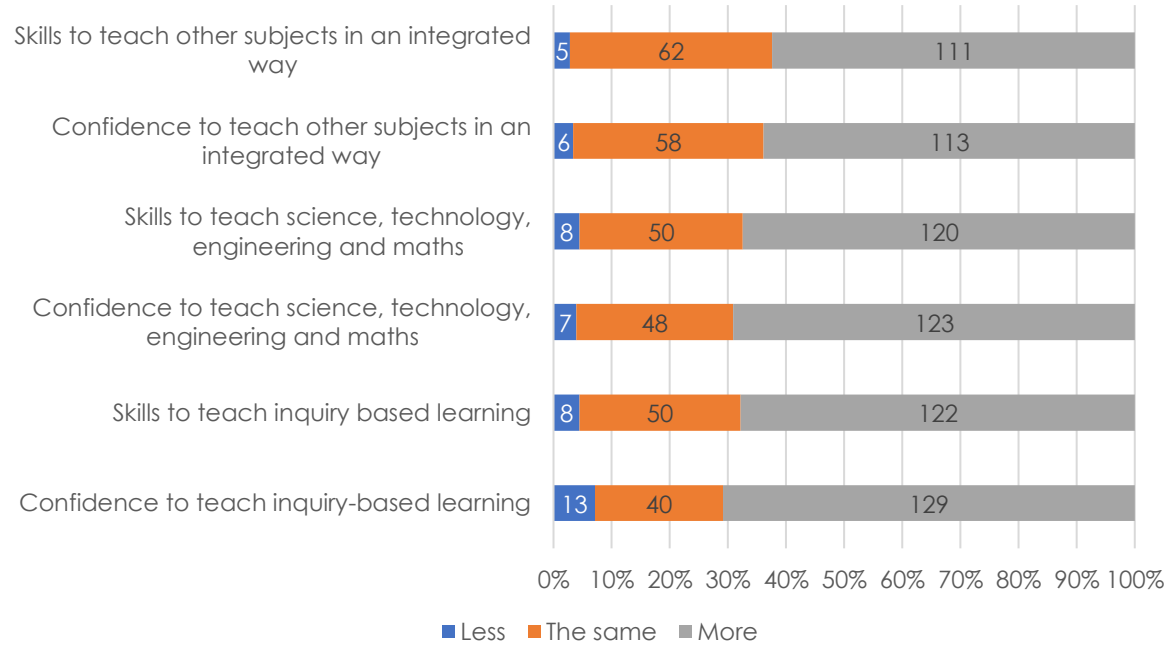


Figure 29: Teachers' skills and confidence after participating in ESB Science Blast (n=177)

'My way of teaching science is different now - rather than teaching at them I explore a concept with them - it's a much better way to teach science'. (Teacher, Dublin)

'For a teacher, having them independent helps you because they take ownership and then you can help the kids who can't do it.' (Teacher, Wexford)

'These are the days we remember - I'm mad about independent learning - they took ownership, controlled, followed it through - that's what teaching is all about - encouraging independence. This gave me a way to do that.' (Teacher respondent)

One virtual participant highlighted that it supported them to develop knowledge and confidence teaching science.

'It's like CPD for myself because I got to research things and different slants on the topic. I did lots of learning on different topics because I need to learn it to support them with it. It makes me feel more confident teaching certain topics in science – I've had to go into depth with them – you're doing more complicated things that aren't on the curriculum. It pushes you along as a teacher too.'

8.4 Outcomes for Schools

Teachers were asked to give their opinions on the impact of participating in ESB Science Blast for their school. Most teachers reported positive outcomes for their school. The outcomes with the highest reported increase were excitement and enthusiasm for STEM among the participating class (89%, n=157), ideas and inspiration for participating teachers (87%, n=154) and showcasing children's learning to the school community (84%, n=149).

Several teachers interviewed highlighted how they had organised opportunities for participating children to interact with other classes and showcase their learning to them, providing an opportunity for younger age groups to ask questions and learn from them.

'The kids presented to other classes as well so they're learning about presenting, communicating etc. It's inspiring more than our class - younger kids are coming up to me asking questions about it in the schoolyard.' (Teacher, Galway).

'We wouldn't be very science-based in our school - we're lacking in that area - so it helped us by getting them working towards something.' (Teacher, Wexford)

'Great way of involving parents & wider school community, got them involved in things we couldn't normally do.' (Teacher, Monaghan)

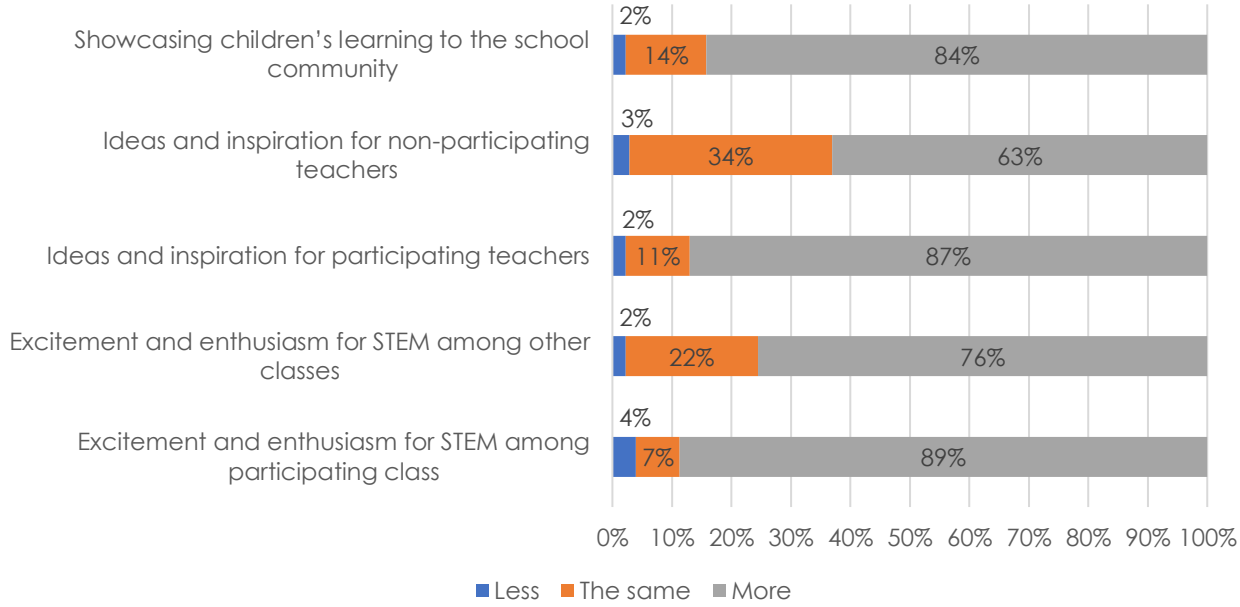


Figure 30: Teachers' views on the impact of ESB Science Blast on schools (n=171)

8.5 Summary

Outcomes for children as reported by children	**Outcomes for children as reported by teachers**	**Outcomes for teachers and schools**
Most children reported increased confidence in ✓ Working as a team (71%) ✓ Preparedness to attend a big event like the RDS showcase (66%) ✓ Carrying out an investigation and putting results together (64%) ✓ Giving their opinion in class (58%) ✓ Solving problems (54%) ✓ Presenting to and answering questions from an adult they didn't know (53%)	Most teachers reported changes for children in ✓ Actively engaging in their own learning (94%) ✓ Enthusiasm and excitement about science (93%) ✓ Working as a team (93%) ✓ Pursuing an area of interest to them (88%) ✓ Presentation skills (86%) ✓ Listening to their classmates (86%) ✓ Ability to respond to an adult's questions (85%)	Most teachers reported increased ability to support their class to develop STEM skills ✓ Present their findings and respond to questions (91%) ✓ Develop a science question or hypothesis (88%) ✓ Integrate with other subject areas in the curriculum (87%) ✓ See the real-life application of STEM (86%) ✓ Explain basic science principles (84%) ✓ Test a question / hypothesis (79%) Most teachers reported ✓ Increased skills and confidence to teach in an integrated way (62 - 64% respectively) ✓ Increased skills and confidence to teach STEM (67 – 64% respectively)

Children also reported: ✓ Increased interest in working in a STEM job in future (65%) ✓ Increased interest in studying STEM subjects (65%)	✓ Applying STEM to real life situations (81%) ✓ Identifying their own strengths, both academic and non-academic (81%)	✓ Increased skills and confidence in inquiry-based learning (68 – 71% respectively) Most teachers also reported impact for schools: ✓ Supports them to showcase children's learning to the school community (84%) ✓ Provides excitement and enthusiasm for STEM among other classes (76%) ✓ Provides ideas and inspiration for non-participating teachers (63%)

6 Barriers to Participation in ESB Science Blast

6.1 Introduction

To inform the strategy for future expansion of the programme, the RDS sought to understand the barriers that prevented schools from participating in the programme. It should be noted that some of the barriers highlighted relate to broader challenges related to STEM teaching in primary school beyond the control of the programme itself. Teachers who attended the RDS showcase event were asked for their views in the teacher survey. In addition, interviews were held with non-participating schools, particularly those in under-represented areas, to understand barriers from their perspective. This chapter synthesises these perspectives.

6.2 Perspectives of Participating Teachers

Teachers attending ESB Science Blast gave their views on what they thought might prevent other schools from participating (n=171). The most common reason reported was a lack of confidence in teaching science, with 53% of teachers surveyed citing this as their top concern (n=90). Another major concern was a lack of time in the school year, with 51% of teachers stating that this was a barrier to participation (n=88). The least common reasons cited were a lack of principal support (10%, n=17) and concerns about travel to the showcase not working for their students (11%, n=19).

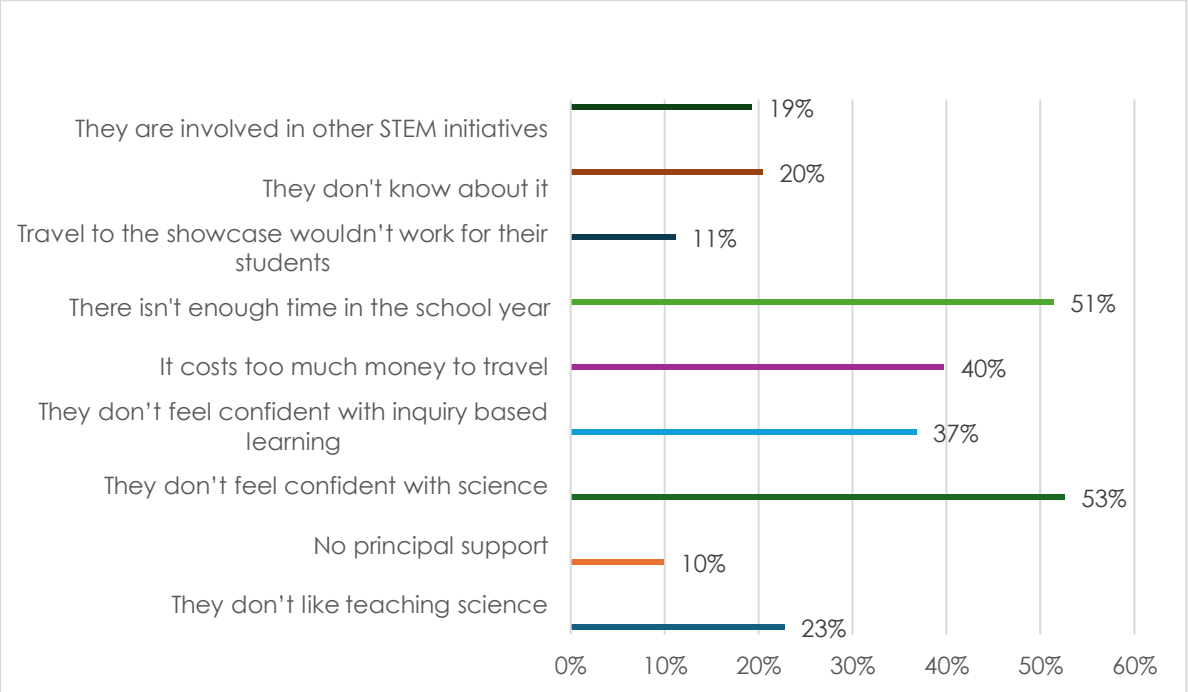


Figure 31: Teachers' views on reasons other schools don't participate (n=171)

6.3 Perspectives of principals and teachers from non-participating schools

Seven teachers and five principals from across Donegal, Dublin, Galway, Kerry, Laois, Leitrim, Mayo, and Meath gave their views on barriers to participation and what might help increase the accessibility of ESB Science Blast to different schools. Participants were recruited in several ways: RDS outreach to non-participating schools, Quality Matters outreach to non-participating schools and outreach via one Education Support Centre. Three of the twelve schools were DEIS band 1 schools, two had participated before but hadn't returned, and others had not participated before. Interviews with two teachers participating virtually from Cork and Westmeath also covered barriers to participation at the showcase so are included here too. Barriers highlighted are summarised below.

The following conventions are used to describe the frequency of comments arising.

Most	Mentioned by nine or more interviewees
Many	Mentioned by six or more interviewees
Several	Mentioned by three or more interviewees
One	Mentioned by one interviewee only. These are included to give more specificity to themes or suggestions made.

6.3.1 Location of showcase events

The existing showcase locations were highlighted as a barrier to most non-participating schools (n=10). For example, the distance for Donegal schools to travel to Dublin or Limerick was considered too much and they didn't see Belfast as an option for them as it could exclude international protection students who couldn't cross the border.

'To attract anyone from Donegal you'd need to go to Sligo.' (Principal 1)

A teacher from Galway said that while Limerick might be accessible to them, less than an hour by bus would be a lot more attractive to them, suggesting Athlone or Galway city as alternative options. A teacher from Leitrim also said that they would be much more likely to go if there was a showcase in the west of Ireland citing Athlone, Galway, or Sligo as more feasible options.

For several schools it was the intersection of the location and ability to support their children with additional needs that made participation unattractive. A previously participating school in Mayo said that bringing children with additional needs that distance and into an enormous venue like the RDS was not possible for them, and their previous experience of the Limerick showcase was disappointing in that it wasn't interactive for the children.

'If there was something local, we'd be first in the queue.' (Principal 5)

Smaller county-based initiatives were highlighted as an alternative, which could also support increasing STEM aspirations and accessibility. For example, ATU in Letterkenny do coding and engineering

activities and have been building up their courses and could present an opportunity for children to see a locally accessible third level institution that way.

'The children would get as much from that as going to the big showcase and it's a lot less hassle. A lot of the children I teach are planning their exit strategy from school already. They want to finish at 16. Having something locally would be more beneficial to them – having an excuse to show them these facilities would be huge. Parents can't afford rent in Galway or Dublin.' (Principal 1)

Another teacher agreed that showcases on a smaller scale could be just as valuable for children and one option could be seeking support from Education Support Centres for models on a smaller scale and within closer proximity (e.g. half an hour maximum).

'At the end of the day, they're small children and won't see the distinction between being in the room with 50 children versus 500 children'. (Teacher 7)

'

Several teachers who had participated in STEMTACULAR, a primary school science fair in Leitrim, spoke of the ease afforded by a more local option, something highlighted by virtual participants too.

'*If it was regional, I would go to it. They're very innocent country children. I would have brought them if it was in Athlone, Tullamore or Mullingar.' (Teacher 8)*

A preference for a more local option was also highlighted by one school in Dublin on the Northside which suggested an alternative like DCU would be more attractive to them.

6.3.2 The cost of travel is an insurmountable challenge for some schools

Many schools highlighted that the cost of travel would be a disincentive to participate. In some locations bus costs could be up to 800 euro to attend for the day, which was prohibitive.

'Cost is a huge factor for getting involved in anything. Schools are cutting back on everything – from the amount of kitchen roll that we use to the location of the school tours'. (Teacher 7))

One DEIS school in Dublin highlighted the cost of travel and location as the biggest barrier for them. A few schools highlighted costs as an issue but felt comfortable asking the parents' association to support fundraising for it; others didn't.

6.3.3 There is potential to further increase awareness of ESB Science Blast and what it involves

Several schools mentioned not being aware of ESB Science Blast and hadn't seen any advertising of ESB Science Blast through emails. They highlighted the enormous number of initiatives that are

promoted to schools, so that some are easily missed or don't make it to teachers' attention unless a principal recommends it. One teacher from Galway said she would have participated if she had known about it, as she was doing lots of science project work with her class, and it would have been a nice opportunity to showcase it. Another school had signed up but misunderstood the sign-up process and thought there was a different deadline for Limerick.

Several other schools had heard of it, but without knowing what it involved. They highlighted that they would need a strong recommendation from another teacher, or another school, who could explain the process, where to start, what is expected and what you would need to bring.

> *'We've seen information about Science Blast, but I don't know anyone locally who has done it. Having another school recommend it and tell you what is involved makes a huge difference. I'd need a contact point to check in with about whether it's runnable or not.' (Teacher 4)*

> *'I would need someone to come into the school and explain the model – showing how it can be done. I'm most likely to take up something where someone tells me exactly what to do.' (Teacher 2)*

In the absence of a local recommendation to participate, they recommended having someone come to schools to give them an idea of what's involved, involving the Education Centres in marketing it, or providing advice given the relationships they have with schools, or workshops or science demonstrations in schools to encourage schools to get involved.

6.3.4 Time is a significant constraint for teachers

Many teachers and principals highlighted feeling that there wasn't enough time in the school day. One said that they barely had enough time for things like P.E. - which is only scheduled for one hour per week- and that going beyond one hour for science per week means that you are taking time from other subjects.

Related to this, often schools buy 'schemes' to cover curriculum areas, which can be a huge time-saver for teachers. However, this can be an obstacle to integrated teaching and learning or teaching key skills because teachers may feel that they need to cover all these areas, limiting their scope to teach other subjects.

One teacher highlighted the new maths curriculum inclusion of more experiential learning (moving away from textbooks) presented an opportunity for initiatives like this. They highlighted that for teachers, the part of their day that is focused on something new will likely be focused on maths, so pitching the initiative as helping to cover the maths curriculum would help.

6.3.5 Participation in alternative STEM initiatives

Several schools participated in alternative county-based science festivals, school-based science festivals or school-based STEM initiatives. One principal highlighted that while many schools know about ESB Science Blast, they choose not to go because of time constraints or engagement in other initiatives, especially if they felt that their STEM work was being covered in other ways.

'Science Blast is nice but not essential'. (Principal 2)

For example, in February 2024, 28 schools from across Cavan, Leitrim, Longford, and Roscommon participated in STEMTACULAR, a primary school science fair in Leitrim. Several participating teachers highlighted how this provided children with an excitement and enthusiasm for science through hands-on interactive projects, an opportunity to showcase their work to the public, judges, parents, and other schools, and provided a space for different children to shine, without the logistical challenges of bringing children to a big event in Dublin.

'If STEMTACULAR is here again next year, I'll be going there, not to Science Blast'. (Principal 3)

Another school organised their own school-based science festival coinciding with science week. They had a dedicated leadership position focused on science and ran an annual open day where children showcase their science work to parents and the school community.

Another school participated in a Lego initiative supporting 10 schools over three years in Meath which offers supplies and training to teachers. For teachers, a major benefit of this initiative was the ease of following the programme, because it comes to them, and they get something very tangible out of it (Lego supplies for the school).

6.3.6 Initiative overload

Several teachers and principals confirmed the views from key informants that schools were overloaded with initiatives being promoted across a range of areas. One principal of a small rural school said that schools can realistically only participate in one initiative per year, and they have prioritised another one. Another said that schools like to pick a few things and do them well.

A few teachers highlighted the pressure that teachers are under, and that initiatives need to seem 'easy'.

'The most attractive ones for teachers are the ones that don't look like extra work – you have all the resources you need; it sounds manageable and not that stressful. If it looks like extra work, then it's a barrier'. (Teacher 3)

6.3.7 Discomfort with science and inquiry-based learning, and challenges in covering 'the basics'

Several schools (including both DEIS schools) highlighted the challenges that teachers face in covering the basics of reading and writing (n=5), and that teachers' priorities would be on English, Irish, and Maths. Teachers can be daunted by science or inquiry-based learning, and it can take time for them to feel confident building discovery skills, children's participation in their own learning, etc.

'You need the relationship with the children to be able to do this kind of learning with them'. (Principal 1)

Another teacher highlighted that teachers moving between new classes could be a barrier because they don't know their class yet and how well able they would be for it.

One DEIS school highlighted that initiatives which come into the school to support teachers in areas where they are less confident are important, highlighting the model of junior achievement, and recommending more initiatives which support teachers in schools so that it is not down to teachers on their own. Another example is a six-week P.E. initiative where a coach comes in for the first week and provides the footballs, and the teacher continues it after that with support.

'It's great because they come in and run it – it takes the pressure off the classroom. We have to be careful not to hit teachers' personal pockets.' (Teacher 1)

Another principal highlighted that teachers aren't well equipped to teach science and can find inquiry-based learning challenging.

'Teachers fear looking bad in not knowing the answers'. (Principal 2)

One teacher highlighted that some teachers see it as something which needs to be really scientific – that it is a version of young scientist and that it needs to be complicated, rather than just introducing small children to science. Another issue that might be a disincentive for teachers was a concern of how their display would compare to others and that theirs might not be as good as what others do. Multiple interviewees highlighted the importance of marketing it as simple and that:

'It doesn't need to be discovering the next big thing with science. They can explore something that is known already, because it's new to the children.' (Teacher 7)

6.3.8 Staffing

Several schools highlighted challenges in relation to staffing as a barrier to participation. Concerns related to feasibility within the classroom as well as being able to attend the showcase event.

One principal highlighted the challenges of staff turnover and retention and how new teachers were much less likely to take on an initiative like ESB Science Blast.

> *'If teachers are new, they don't know the class, and it can take time for them to get used to the children in our school – the needs they have and the issues they face.' (Principal 1)*

Three schools highlighted that extra staff being able to travel to an event would be an issue. One said they are permanently down five teachers and can't get sub-teachers.

> *'Having enough staff to cover the kids at the moment is enough of a challenge. Lining up SNAs to support the trip while leaving adequate staffing at the school is an issue.' (Teacher 3)*

Another teacher suggested that staffing to support travel to the event would be manageable with enough notice and preparation.

A teacher from a class with high proportions of children with additional needs highlighted the challenges of doing projects like this in the classroom. They explained that facilitating an environment where children can work independently in groups requires greater classroom support for children with additional needs.

> *'You can't work a new initiative unless you've been within a school for a few years. If you're spending half an hour dealing with an issue from yard, it's harder to let them work away by themselves. Restorative work takes time. Adding another pressure to complete a project when you don't know that you'll have the time for it would stop me participating. If your SNA is out, you can't do it.' (Teacher 2)*

6.3.9 Concerns about how they would manage at the showcase event

Several schools highlighted discomfort and uneasiness in relation to managing children in a big, crowded, noisy space like the RDS, having them moving around the event itself, and not knowing where they are. One principal highlighted a concern that the class-based nature of it might lead to some children to disengage if there was not enough to keep them occupied.

Several teachers highlighted the extra workload for teachers in organising additional days out – risk assessments, lining up staff, garda vetting parents to be able to go along on trips, etc. There were also mixed views on desirability of bringing parents along to the event. While a few didn't see this as a solution (as they felt that children were more likely to misbehave with parents around), a few others highlighted that this could make it workable for them, and that it helped if there was a well-established school community with strong links to parents.

Several schools highlighted the challenges of bringing children with additional needs or any behavioural issues to an event such as this, saying that it would put them off it completely or that additional staff would be needed to be able to do it. They felt that these issues would be more manageable if the event was closer to home.

> *'If I had a child with behavioural issues and had to go there, I just wouldn't do it. In a local setting where everyone is doing their own project, and everyone is busy talking to judges then it's different'.' (Principal 3))*

> *'If I had a child with big sensory needs or autistic, I'd be concerned that the day would be very stimulating, and they would get tired and overwhelmed. We'd have to reassess as a team if it would be worth going to it. You can't leave them out but it's difficult for them. They're out of their comfort zone. (Teacher 6)*

6.3.10 Other comments

Several additional comments were made about what might incentivise participation in ESB Science Blast. A few felt that resources would incentivise schools to participate, especially if the investigation required science equipment. While a few had built up a bank of resources over the years or felt that they could do 'kitchen science' with materials and equipment that is easily accessible, others felt that accessing equipment to support children to test their questions would help schools – e.g. calculators/head torches/equipment, etc. One teacher highlighted that building up a bank of resources can come at the teachers' own expense.

> *'We needed lightbulbs, crocodile leads, and a voltmeter for our investigation. I had to purchase a good few things myself. I don't mind because I like building up my own bank of resources, but other teachers might not be able to do that.' (Teacher 8)*

Suggestions included provision of resource packs or financial support to support materials or links to a company who could supply materials.

Schools participating in STEMTACULAR were specifically asked about their views on class-based versus small group participation and competitive versus non-competitive. One principal felt that doing one project as a whole class would be difficult.

> *'It's hard to get the whole class engaged. It's hard to get them all jobs to do if you have a class of 30. It would be hard if you had the best five or six students take over, but the rest feel disengaged'. (Principal 3)*

Another teacher felt that it would have been much harder to manage with the full class participating rather than small groups of six to seven children. As for the competitive element of it, one teacher felt it wasn't a major issue for them, but they thought a big prize for schools might incentivise participation.

While they did win a prize, they were participating mainly because they wanted to build their STEM profile. Another school liked the competitive nature as well.

> *'It adds a bit of spice and motivation. For teachers as well, it adds an extra burst of energy. There's pros and cons – some schools don't win and go home deflated'. (Principal 3)*

6.4 Summary

Insights on barriers to participation in ESB Science Blast were received via survey responses from 171 teachers participating in ESB Science Blast, and interviews with seven teachers and five principals from non-participating schools across Donegal, Dublin, Galway, Kerry, Laois, Leitrim, Mayo and Meath and two teachers from schools participating virtually in Cork and Westmeath. The biggest barriers to participation in ESB Science Blast highlighted by participating teachers were teachers' lack of confidence with science (53%), not enough time in the school year (51%), the cost of travel (40%), and teachers' lack of confidence with inquiry-based learning (37%). Barriers highlighted by non-participating schools or those participating virtually were the location of showcase events, travel costs, awareness of ESB Science Blast and what it involved, lack of time, participation in alternative STEM initiatives, initiative overload, lack of staffing, discomfort with science and inquiry-based learning, challenges in covering 'the basics' and concerns about how their class would manage at the showcase event. Several teachers highlighted that resources could help to incentivise participation, and offered views on alternative events which were smaller group based and competitive in nature.

7 Conclusion and Recommendations

7.1 Introduction

This evaluation sought to help the RDS Foundation answer some of the key strategic questions it had about the model to inform future scale and expansion including: How integral the showcases are to the model? To accommodate additional schools, should ESB Science Blast extend the existing showcase events, expand the showcase to additional regions, adapt the model for schools who might not be able to participate in a showcase event by developing local events, or expand the option for virtual participation? What adaptations might help to maximise the impact of the programme?

These questions were discussed during a workshop with the RDS Foundation on evaluation findings and options for future expansion. This chapter presents recommendations which emerged from consultations with children, teachers, principals and key informants and which were then refined with the RDS Foundation. The first set of recommendations relate to programme implementation. The next set of recommendations relate to programme expansion.

7.2 Programme Implementation

Recommendations which relate to delivery of the programme in line with its current standards are presented below.

7.2.1 Prioritise additional staffing

A team of two staff members are dedicated to programme oversight and development, engagement and support of schools, development of resources and marketing materials, content development and management of events (this includes the management and coordination of 212 judges, 501 projects, and 12,525 children for the Dublin event). The staffing has not expanded in line with expanded ESB Science Blast participation rates since its inception in 2019, and shared communications staff time has reduced, which was masked by Covid given that it took place virtually. The programme workload is comparatively high, and it is recommended that an additional staff member be engaged to allow for continued high quality implementation, and expansion or development of this nationally important programme. A Project Officer role is needed to contribute to responsibilities related to event coordination, judging process management, procurement, marketing and additional tasks in the run up to each event, given the high number of participants and administrative work this generates. This would allow the Programme Manager to focus more on strategic questions of importance such as programme development, and partnership building to maximise impact and fundraising, etc. Schools and teachers place huge value on the dedicated contact point they have guiding them through the process of participation in ESB Science Blast given the questions that many have throughout the process. This school outreach role is a valuable role on the team that needs to be preserved.

7.2.2 Maintain the current timing of the Dublin showcase

Most teachers (84%) appreciated the current timing of the showcase event in the second term (between January and March). This allows enough time for the teachers to get to know their class before deciding whether to register, choosing a question to investigate with their class, carrying out an investigation and preparing for the showcase. Typically, there are fewer competing events than in the third term, which often includes sports days, preparations for graduation, confirmations, etc.

7.2.3 Increase the range of interactive activities, stands (and potentially shows)

Children and teachers (n=27) highlighted that more interactive activities and stands (like the ESB stand) would be useful to keep the children engaged, whether that is stalls, presentations from external organisations or an additional show. They highlighted long queues for existing stalls, and that many had run out of 'freebies' for the children so not all children had an equal experience. The ratio of one exhibitor stand for every four project stands in Limerick was the right balance according to the organisers of the Limerick event.

An area for children to 'Meet the Scientist' could help children to be able to see all the different types of scientific jobs available, hear from people about what their day job involves (dentists, doctors, etc.), and speak to scientists about their work. Ideas for interactive activities included a 'Science Challenges Station' which would include interactive items like planets and stars and some brain teasers or riddles or a scavenger hunt. Another suggestion was for a 'Teach Meet' style event where children themselves could be on stage to showcase their projects. An additional suggestion was for winners of the Youth Scientist Exhibition or samples of secondary projects to be brought along for children to be able to see what their scientific journey into secondary school might look like. As for themes, suggestions included more on the local environment, space and healthy eating initiatives. Given how much children enjoyed presenting their projects to adults, an additional suggestion was that teachers themselves might be encouraged to visit several other schools to ask about their projects. This would serve a dual purpose of keeping children engaged and facilitating children getting more experience presenting their work to adults and responding to questions.

7.2.4 Make greater adaptations to make the showcase autism-friendly

Several children and teachers (n=23) commented on the 'quiet room' being too far away from the main experience, lacking in sensory equipment, and without adequate supervision to be fit for purpose for children with autism.

Suggestions for greater accessibility for autistic children include allocated spaces at the edge of rows for performances to facilitate quick movement away from that space, an option to watch the live-stream from a quiet room for those who find the stage area overwhelming, and accessibility lanyards or cards to facilitate being able to skip queues for different stands. Suggestions for a 'sensory room' included sensory items like beanbags and squishy toys, something which allows children to still interact

with some form of scientific stimulation rather than a complete absence of sensory triggers, and some form of supervision to ensure that the environment was suitable for those in it.

Other major science or experiential events for children or organisations like AsIAm, who specialise in training to make spaces autism-friendly, may be useful to seek guidance from.

7.2.5 Maintain high levels of staffing at the showcase

Participating teachers commented on feeling comfortable allowing children to wander the event independently. In interviews many highlighted the high levels of friendly staff available to guide the children where needed. This would be important to maintain for future events.

7.2.6 Review food provision at showcase with the goal of providing healthy, child friendly options

Children and teachers (n=24) commented on the high prices and lack of healthy options in the food offering at the showcase. Pricing also created a sense of inequality with some children being able to afford to buy food while others could not. Food provision presents an opportunity for enhancing integrated learning for children as food education and nutrition is included in Social Personal and Health Education. It also presents an opportunity to align with the Sustainable Development Goals (e.g. SDG 2 focuses on sustainable agricultural production, decreasing food losses and waste, and ensuring those who are suffering from hunger and malnutrition have access to nutritious food). More child friendly and lower cost options should be incorporated in future events. Partnerships with initiatives like Food Dudes, Incredible Edibles or the START campaign could have an opportunity to enhance the holistic ESB Science Blast experience.

7.2.7 Improve the timing and quality of judges' feedback

Several teachers (n=13) highlighted timing and quality of judges' feedback as areas for improvement. Some highlighted that having a dedicated time for a judge's visit would help to ensure that all children were able to be at the stand and benefit from that experience with the judges. Others felt that more training for judges to support them to be confident talking to children, asking follow up questions, and giving project specific feedback was important. A webinar with top tips for talking to children should be offered to all judges in advance. Verbal feedback could be given by judges considering time constraints among some schools with follow up written feedback. AI technology which could help judges in writing up feedback forms should be explored.

7.2.8 Extend the role of judges in promoting ESB Science Blast

ESB Science Blast has a network of almost 300 judges from across government, academia, education and industry. Judges have potential to be strong ambassadors for ESB Science Blast and their involvement could be further optimised. This could involve speaking on the showcase day, providing an inspirational video to teachers and schools following the event, engaging in developing resources or

webinars to support teachers and schools, and promoting the programme in their own workplaces and beyond. Repeat judges who have been in the role for three years could be provided with accreditation.

7.2.9 Promote low-cost ideas for class investigations

Children and teachers (n=41) highlighted that additional resources in the classroom would facilitate easier and more frequent experimenting with STEM and help keep students enthusiastic about the subject. Basic science equipment like beakers, test tubes, thermometers, etc. are not available to many schools and some mentioned that they were restricted in what questions they could answer based on the equipment available to them. While funds for science equipment is in the remit of the Department of Education to provide, ESB Science Blast can help ensure science is accessible by promoting low-cost ideas and inspiration for classes with resource constraints who wish to conduct investigations.

7.2.10 Provide (and market) additional resources and learning opportunities for teachers

To support teachers at the showcase event

Ideas for this included learning spaces for teachers at the showcase with useful resources to support teaching STEM in class and promote integrated teaching. A few teachers highlighted that more seating for them in the display areas would be appreciated.

To orientate teachers to the programme

Many teachers liked the existing materials which supported them to understand the programme, and first-time participants found the introductory webinar very helpful. However, many teachers sought additional guidance, including more examples of previous projects, how projects are run in the classroom and a step-by-step run-through of different stages of the project (which might include suggestions on timings/sourcing equipment, so they don't run out of time for the investigation). They also wanted more guidance ahead of the showcase, e.g. ideas for how the display might look, ideas for using props to make the stand interesting, etc.

To help teachers make the most out of the programme

Teachers requested support via webinars, training, and information on how to bring STEM into the classroom and ideas to spark and maintain children's interest in STEM. External stakeholders also highlighted that teachers would benefit from additional support on the inquiry process, e.g. by choosing testable questions rather than research questions – to support children's participation.

To provide teachers with STEM ideas and inspiration

Key informants highlighted the need for more signposting of initiatives, resources and supports for teachers to make it as easy as possible for teachers to engage in STEM initiatives as they often won't have the bandwidth to assess the value of different initiatives. Many teachers requested practical teaching resources, e.g. ideas to teach levers or electricity. Oide is currently doing work to synthesise resources in this area, and the NCCA has highlighted that a Science, Technology, and Engineering Education Toolkit is being developed. ESB Science Blast should review its communications materials and

fora with partners to maximise signposting opportunities and highlight how it supports teachers with implementation of the new curriculum. User testing among teachers for the new website should be considered.

7.2.11 Encourage schools to engage younger children by showcasing findings in their school community

While not a key feature of the programme, many participating schools supported children to showcase their findings in their school community, in addition to participating in the showcase event (84% of teachers reported that ESB Science Blast gave them more opportunity to showcase children's learning to the school community). This involved children presenting to other classes in the school or a STEM open day where parents were invited in to learn more about their investigation. It is recommended that schools are encouraged to engage younger groups of students within the school, e.g. through buddy days with younger classes, giving ideas for school-based inquiries for younger groups – e.g. curiosity walls, etc. and that a form of recognition for this is developed to incentivise initiatives and future engagement. It is also recommended that schools are encouraged to engage local and regional media, given the pride and value that children place on showcasing their learning. It is also recommended that case studies of schools showcasing their learning among their school community are developed and shared, and surveys are conducted with teachers six months post-participation to capture whether this is happening.

7.2.12 Review bus subsidy to encourage more equitable participation

The cost of transport was raised as a barrier to participation by participating schools (n=2) as well as non-participating schools (n=9). The current subsidy of €150 towards bus costs wasn't enough to incentivise participation from some schools whose bus costs could have been up to €800. It should be noted that this factor was rarely mentioned alone as a reason for not participating and was more likely to be part of multiple reasons disincentivising teachers to participate. However, it is recommended that staggered subsidies are considered prioritising larger amounts for DEIS schools in lower represented areas to encourage more equitable participation in underserved areas.

7.3 Programme Expansion

Considering the evaluation findings, it is recommended that the programme is ambitious in its vision for expansion – i.e. that every child in Ireland should be able to participate in ESB Science Blast as part of their STEM education journey. To make strides towards this vision, the following recommendations are offered in relation to programme expansion.

7.3.1 Expand showcase to additional locations

The current reach of the programme is approximately 13% of mainstream primary schools in the Republic of Ireland and 1% of schools in Northern Ireland with substantial regional variations. Except for Belfast, there is a high correlation between the highest participation rates (Dublin, Wicklow and

Limerick) and the location of the showcase. Key findings have shown that the showcase itself is a key feature of the programme. A large majority of children (69%, n=474) said that attending the showcase event was the best thing about ESB Science Blast. It was also among the top three most important elements of the programme for teachers (16%), along with letting the children carrying out the investigation (37%) and letting the children decide what they investigated (37%). Children particularly enjoyed it for being a day out of school (58%), an opportunity to learn about science (57%), seeing other school's projects (54%), showing off their project (51%) and meeting a real scientist or judge (46%). Most non-participating schools interviewed (n=12) cited location as a major barrier to participation, suggesting smaller scale events within 30 mins – 1 hour distance would be more feasible for them.

Considering the above, it is recommended that while larger events could be maintained for a 'wow factor' once-off experience for all primary school children, additional smaller scale showcase events should be trialled, starting with Sligo in 2025. Additional locations to consider in future should be Athlone, Galway, Cork. Waterford, Letterkenny. The following considerations are important in the choice of location:

- The venue should be in one location to reduce movement of children between buildings.
- The venue should be of a minimum size of four basketball courts and include one carpark which could hold 40 cars. One hall is adequate.
- Ideally it is well-lit and has good acoustics.
- There should be a location very close to the main event room that can be used to provide a quiet room/sensory room.

Partnerships should be made with other organisations, beginning with universities, to explore low-cost venue provision reflecting an overall strategic vision between ESB Science Blast and the institution.

The following should be minimum standards for regional events:

- The non-competitive nature must be maintained as it is core to the model.
- They include a minimum of 20 projects.
- Some entertainment should be provided for the children to ensure it is an engaging experience.
- The ratio between exhibitor stands and project should be a minimum of one to four.
- The event should include judges with a mixture of genders, profiles and backgrounds.
- Smaller events should fit into a school day, so beginning at 10am and finishing by 1pm is ideal.

The current model for prioritising applications for participation in the programme is on a first come first served basis. In future years, in case of events becoming oversubscribed there may be a need to develop participation criteria (e.g. first-time schools, under-served areas, etc.).

7.3.2 Develop a targeted strategy for expansion in Northern Ireland if this is agreed as a strategic priority

While it is an RDS priority that ESB Science Blast is an all-Ireland initiative, participation rates from Northern Ireland schools are much lower than in other regions notwithstanding one of the showcase events being in Belfast. Antrim, Armagh, Down, Fermanagh and Tyrone all have participation rates of less than 2% with Derry as the exception with five schools participating. Barriers to schools' involvement in ESB Science Blast in Northern Ireland have been investigated by the RDS (McGleenon and Harrington, unpublished). Barriers highlighted are logistical (timing, length of day, venue), political (competing initiatives) and systemic (the educational culture and system itself). One key informant highlighted the need for greater strategic investment in Northern Ireland for ESB Science Blast to succeed as an All-Ireland initiative given that its entry point in the curriculum is less straight forward. A targeted strategy for expansion in Northern Ireland requires time, partnership building and funding to increase participation. If expansion is to be prioritised, this requires an outreach officer in Northern Ireland.

7.3.3 Develop STEM partnerships and convene lead organisations to mainstream STEM and inquiry-based learning across the education system

The landscape for STEM education is in a period of significant transition. It has already been recognised (and confirmed by ESB Science Blast participation rates, key informant interviews, and interviews with non-participating schools) that STEM experiences vary significantly across schools, with some participating in multiple initiatives, and others who may not participate in any. The new STEM curriculum presents an important opportunity to catalyse stronger State-industry partnerships to ensure deeper, more equitable STEM experiences for all children. Based on the feedback from children and teachers, there is a strong case to be made that all children should be able to participate in a primary science event at least once. Key informants made the case that visits from scientists to schools should be another part of the offer. It is recommended that a joint plan for supporting schools with STEM engagement be developed with key partners working in this space, both State and industry, particularly targeting STEM deprived areas. This should include greater coordination around STEM education for teachers.

7.3.4 Develop and expand the Continued Professional Development programme for teachers

The biggest area of support teachers requested was in inquiry-based learning (49%, n=83). It is recommended that the existing summer course provided by the RDS is expanded and further advertised to teachers to facilitate this. This might also incentivise new schools to participate. It is also recommended that partnerships are developed with Educational Support Centres, which play an important role supporting schools in their locality, to develop a CPD programme covering STEM in the new curriculum, inquiry-based learning, and integration, linking to active citizenship and the local environment.

It is recommended that additional funding is sought to subsidise the course, and the course be accredited to incentivise teachers. It is recommended that the RDS coordinate with key partners

providing CPD in this space to maximise reach and impact. Skillnet and OIDE would be well-situated partners for this programme.

7.3.5 Consider additional options for advertising to schools and teachers

Existing advertising channels include direct advertising to schools, advertising through the Department of Education, advertising through Patron HQs (Educate Together, COGG, etc.), a targeted booklet for Gaelscoileanna, principals' networks and via the INTO. Additional advertising options which could be explored include partnerships with Education Support Centres, organisations already in schools (e.g. STEM in the box), ESB Science Blast features by influential Instagram teachers, or ESB Science Blast resources made available on Twinkle.

7.4 Summary

This evaluation came at an important time of opportunity to consolidate and strengthen efforts to ensure every child in Ireland benefits from quality STEM education in primary school. Insights from children and teachers participating in the Dublin showcase event, which for the first time captured the voices of children themselves, highlighted how Science Blast has been a remarkable and unique experience for children and teachers inspiring curiosity and supporting children with key skills.

Recommendations emerged from consultations with key informants, children, teachers and principals about how to maximise the impact of ESB Science Blast and how it could be expanded in future. These were discussed and refined with the RDS Foundation team. Recommendations to strengthen programme implementation include prioritising additional staffing, maintaining the current timing of the Dublin showcase, increasing the range of interactive activities and stands at the event, making greater adaptations to make the showcase autism-friendly, maintaining high levels of staffing at the showcase, reviewing food provision at the showcase, improving the timing and quality of judges' feedback, expanding the role of judges in promoting ESB Science Blast, promoting low-cost options for class investigations, providing and marketing resources and learning opportunities for teachers, encouraging school based initiatives following the event, and reviewing bus subsidies to encourage more equitable participation. It is also recommended that the programme is ambitious in its vision for expansion given its alignment to the revised STEM curriculum. Every child in Ireland should be able to participate in ESB Science Blast as part of their STEM education journey. Recommendations include expansion to additional locations, convening key partners in STEM education ahead of the roll out of the revised curriculum, a more targeted strategy for expansion in Northern Ireland, expansion of continued professional development in inquiry-based learning, and additional marketing of the programme to schools.

8 Annex 1: Children's Feedback Form

By completing this form, you will be in with a chance to win an IPAD for your school, generously donated by Jones Engineering!

We want to hear about your experience of doing ESB Science Blast – both in class – and coming to the RDS, and what could make it even better. Your input is anonymous - no one will know what you said.

Your Experience at ESB Science Blast

<table>
<tr><td colspan="2">Project Name:</td></tr>
<tr><td colspan="2">Q1. In your own words, what is the best thing about ESB Science Blast?</td></tr>
<tr><td>Q2. Tick the 3 best things about the project.
☐ Choosing the question ourselves
☐ Carrying out the investigation ourselves
☐ Showing off our work to others
☐ Coming to the RDS
☐ Talking to a scientist about our work
☐ Working together as a class</td><td>Q3. Tick the 3 best things about the RDS event.
☐ A day out of school
☐ Free things
☐ Showing off our project
☐ Seeing other schools' projects
☐ Learning about science
☐ Learning about different organisations' work
☐ Meeting a real scientist / judge</td></tr>
</table>

	☐ Meeting children from other schools
Q4. Compared to other things you do in class, how much fun was the ESB Science Blast project for you? Tick one. ☐ Way more fun ☐ A little bit more fun ☐ Same as other things we do ☐ Not as much fun ☐ Way less fun	**Q5. Who decided on the focus of the investigation and how to carry it out? Tick one.** ☐ Teacher ☐ A group of children ☐ The full class agreed it ☐ I don't know

Q6. After participating in ESB Science Blast, tick how confident you feel in each of these areas.

	Less confident	The same	More confident
(a) Giving my opinion in class	○	○	○
(b) Working as a team with my class	○	○	○
(c) Presenting to and answering questions from an adult I don't know	○	○	○
(d) Asking questions that I don't have the answers to	○	○	○

(e) Solving problems	○	○	○
(f) Carrying out an investigation and putting results together	○	○	○
(g) Attending a big event like this	○	○	○

Q7. Did ESB Science Blast make you more interested in a job in Science / Technology / Engineering or Maths when you are older?

- ☐ No
- ☐ Yes, a bit
- ☐ Yes, a lot
- ☐ I was already interested
- ☐ Not sure

Q8. How interested are you in studying Science / Technology subjects when you go to secondary school?

- ☐ Not interested
- ☐ Yes, a bit
- ☐ Yes, a lot
- ☐ I already wanted to study Science / Technology
- ☐ Not sure

Q9. What would make you excited about learning Science, Technology, Maths and Engineering next year?

Q10. Do you have any other feedback about ESB Science Blast – good or bad?

Your School

School Name:	**Stand number:**	**Day:**
Type of school: ☐ Girls only ☐ Boys only ☐ Mixed	**Class:** ☐ 3rd class ☐ 4th class ☐ 5th class ☐ 6th class	**Gender:** ☐ Girl ☐ Boy ☐ Non-binary
My parents / guardians were born: ☐ In Ireland ☐ In another country ☐ Both	**My parents / guardians work in a Science / Technology / Engineering / Maths job** ☐ Yes ☐ No ☐ I don't know	**Science is considered important in my school:** ☐ Yes, we do lots of Science ☐ No, we don't do much Science ☐ Not sure

What next?

Thank you for your feedback. After this event, Quality Matters, a research charity, will analyse all feedback from children and teachers and write a report. We will include some quotes from children, without naming anyone. The RDS Foundation will then decide what changes they want to make to the ESB Science Blast Programme.

9 Annex 2: Teacher Feedback Form

Thank you for taking part in a survey for ESB Science Blast. The RDS Foundation is evaluating the impact of the programme and how it can be improved. Teacher feedback is essential to understand how the programme can best be expanded and adapted in the future.

This research is being undertaken in partnership with Quality Matters, a research charity, who will prepare a report synthesising the findings. Your feedback is completely anonymous. We may include quotes to illustrate specific points, however, they won't be attributed to any specific individual or school. We will ask for your name and school so that you can be entered into a draw to win a €150/ €50 voucher. This information will not be linked to the survey results.

The survey will take approximately 10 minutes to complete.

Thank you for your time and assistance with completing this survey!

If you have any questions about this research, please feel free to contact Ellen Travers, Senior Project Specialist at Quality Matters at ellen@qualitymatters.ie.

Section 1: Background Information
Here we ask for some demographic information about your school, your background in STEM and your involvement in STEM initiatives to date.

1. **What is your name?**

2. **What is the name of your school?**

3. **Approximately how many children are in your school? (Select one option)**

- ○ Fewer than 50 pupils
- ○ 50-99
- ○ 100-199
- ○ 200-299
- ○ 300-499
- ○ 500+

4. **Is your school: (Select one option)**

- ○ Rural
- ○ Urban

5. **Is your school: (Select one option)**

- ○ Special
- ○ Mainstream

6. **Is your school a Gaelscoil? (Select one option)**

- ○ Yes
- ○ No

7. **Is your school a DEIS school? (Select one option)**

- ○ Yes
- ○ No

8. **Is your school: (Select one option)**

- ○ Girls only

- ○ Boys only
- ○ Mixed

9. Where is your school located? (Select one option)

- ○ Carlow
- ○ Cavan
- ○ Clare
- ○ Cork
- ○ Donegal
- ○ Dublin
- ○ Galway
- ○ Kerry
- ○ Kildare
- ○ Kilkenny
- ○ Laois
- ○ Leitrim
- ○ Limerick
- ○ Longford
- ○ Louth
- ○ Mayo
- ○ Meath
- ○ Monaghan
- ○ Offaly
- ○ Roscommon
- ○ Sligo
- ○ Tipperary
- ○ Waterford
- ○ Westmeath
- ○ Wexford
- ○ Wicklow

NOTE : Answer the below question only if answer to((Q#9 is **Dublin**))

10. Where in Dublin is your school located? (Select one option)

- ○ D01
- ○ D02
- ○ D03
- ○ D04
- ○ D05
- ○ D06
- ○ D07
- ○ D08
- ○ D09
- ○ D10
- ○ D11
- ○ D12
- ○ D13
- ○ D14
- ○ D15
- ○ D16
- ○ D17
- ○ D18
- ○ D20
- ○ D22
- ○ D24

11. How many classes are attending from your school? (Select one option)

- ○ 1
- ○ 2
- ○ 3
- ○ More than 3

12. What classes are participating? Tick any that apply.

- ☐ 3rd class
- ☐ 4th class
- ☐ 5th class
- ☐ 6th class

13. Has your school ever participated in ESB Science Blast before? (Select one option)

- ○ No
- ○ Yes, once before
- ○ Yes, more than two times
- ○ Yes, with another school

NOTE : Answer the below question only if answer to((Q#13 is **No**))

14. If you are participating for the first time in ESB Science Blast, why did you decide to participate?

- ☐ Recommended by another school
- ☐ Recommended by another teacher
- ☐ Parents encouraged us to participate
- ☐ My principal wanted us to participate
- ☐ I thought it was a fun way to bring science into the classroom
- ☐ I've seen it advertised
- ☐ Other (Please specify) _____

NOTE : Answer the below question only if answer to((Q#13 is **Yes, once before OR Yes, more than two times OR Yes, with another school**))

15. If you are returning to ESB Science Blast, why did you decide to participate again?

- ☐ We always do it
- ☐ The students loved it
- ☐ It helped me to teach STEM
- ☐ My principal wanted us to participate
- ☐ We saw a huge impact in the classroom

- [ ] Other (Please specify) _____

16. What level of experience do you have teaching STEM subjects? Tick any that apply.

- [ ] Studied science at junior certificate
- [ ] Studied science at leaving certificate
- [ ] Undergraduate degree in STEM
- [ ] Have done CPD in STEM subjects
- [ ] Have participated in other STEM initiatives
- [ ] Other (Please specify) _____
- [ ] None of the above

17. How engaged in STEM is your school already? Tick any that apply.

- [ ] We have a dedicated STEM focus /plan
- [ ] We have a STEM post in the school
- [ ] We actively engage in Science Week/Maths Week/Engineering week
- [ ] We participated in Primary Science Fair before
- [ ] We have engaged with Microsoft Dreamspace
- [ ] We received 'STEM in a box' before
- [ ] We don't have a big STEM focus
- [ ] Other (Please specify) _____

18. How would you describe your own confidence with inquiry-based learning? (Select one option)

- ○ Very confident
- ○ Confident
- ○ Neutral
- ○ Not confident
- ○ Not at all confident

Section 2: Your Views on ESB Science Blast
Here we ask about your experience of ESB Science Blast, and what impact it has had on you, your class and your school. We also ask for your suggestions on how it could be adapted and expanded in the future.

19. In your own words, what is the best thing about ESB Science Blast?

20. After participating in ESB Science Blast, I feel confident to be able to support my class to:

	Yes	A little bit	No
(a) Develop a science question or hypothesis	☐	☐	☐
(b) Test the question/hypothesis	☐	☐	☐
(c) Present their findings and respond to questions	☐	☐	☐
(d) Explain basic science principles	☐	☐	☐
(e) Integrate with other subject areas in the curriculum	☐	☐	☐
(f) See the real life application of STEM	☐	☐	☐

21. Did participating in ESB Science Blast help your class with any of the below?

	Yes	A little bit	No
(a) Actively engaging in their own learning	☐	☐	☐
(b) Pursuing an area of interest to them	☐	☐	☐
(c) Working as a team	☐	☐	☐
(d) Identifying their own strengths – both academic and non academic	☐	☐	☐
(e) Listening to their classmates	☐	☐	☐
(f) Presentation skills	☐	☐	☐
(g) Ability to respond to an adult's questions	☐	☐	☐
(h) Enthusiasm and excitement about science	☐	☐	☐
(i) Applying STEM to real life situations	☐	☐	☐

22. How has participation in ESB Science Blast affected your ability in the following?

	Less	The same	More
(a) Confidence to teach inquiry-based learning	☐	☐	☐
(b) Skills to teach inquiry based learning	☐	☐	☐
(c) Confidence to teach science, technology, engineering and maths in an integrated way	☐	☐	☐
(d) Skills to teach science, technology, engineering and maths in an integrated way	☐	☐	☐
(e) Confidence to teach other subjects in an integrated way	☐	☐	☐
(f) Skills to teach other subjects in an integrated way	☐	☐	☐

23. What level of impact has participation in ESB Science Blast had on your school?

	Less	The same	More
(a) Excitement and enthusiasm for STEM among participating classes	☐	☐	☐
(b) Excitement and enthusiasm for STEM among other classes	☐	☐	☐
(c) Ideas and inspiration for participating teachers	☐	☐	☐
(d) Ideas and inspiration for non-participating teachers	☐	☐	☐
(e) Showcasing children's learning to the school community	☐	☐	☐

24. Which parts of the programme were most important to you? Rank in order of importance (1 being the most important and 5 being the least important).

Letting the children decide what we investigated : _____

Letting the children carry out the investigation : _____

Giving the children a chance to showcase their findings with other classes in the school : _____

Giving the children a chance to showcase our findings to families : _____

Coming to the showcase event : _____

25. Which parts of the programme were most challenging for you? (1 being the most challenging and 5 being the least challenging).

Letting the children decide what we investigated : _____

Letting the children carry out the investigation : _____

Giving the children a chance to showcase their findings with other classes in the school : _____

Giving the children a chance to showcase their findings to families : _____

Getting to the showcase event : _____

The showcase event itself : _____

26. What did you find most valuable about the showcase event? Rank in order of importance.

A day out of school : _____

It's a fun environment for the children : _____

Showing our project to others : _____

Learning opportunity for children about STEM : _____

Connection between children and real life scientist : _____

Learning about other schools' projects : _____

Meeting teachers from other schools : _____

27. When is the best time for the showcase event? (Select one option)

- ○ Term 1 (September - December)
- ○ Term 2 (January - March)
- ○ Term 3 (April - June)

28. Is there anything else you would like to see more of at the showcase itself?

_____

_____

_____

_____

_____

29. Do you think children should be able to participate more than once in Science Blast? (Select one option)

- ○ Yes
- ○ No
- ○ Not sure

30. Do you think schools should be able to bring more than one class to Science Blast? (Select one option)

- ○ Yes
- ○ No
- ○ Not sure

31. In your opinion what stops other teachers or schools from participating in ESB Science Blast?

- ☐ They don't like teaching science
- ☐ No principal support
- ☐ They don't feel confident with science
- ☐ They don't feel confident with inquiry based learning
- ☐ It costs too much money to travel
- ☐ There isn't enough time in the school year
- ☐ Travel to the showcase wouldn't work for their students
- ☐ They don't know about it
- ☐ They are involved in other STEM initiatives
- ☐ Other / please comment _____

32. What support would help you participate in future? Rank in order of importance.

Continued professional development on inquiry based learning : _____

Support / guidance from a model school in my county : _____

A peer learning space in my county/ region : _____

A peer learning space online : _____

Individual support from the ESB Science Blast team : _____

More resources on the website : _____

Help with travel costs : _____

Nothing further : _____

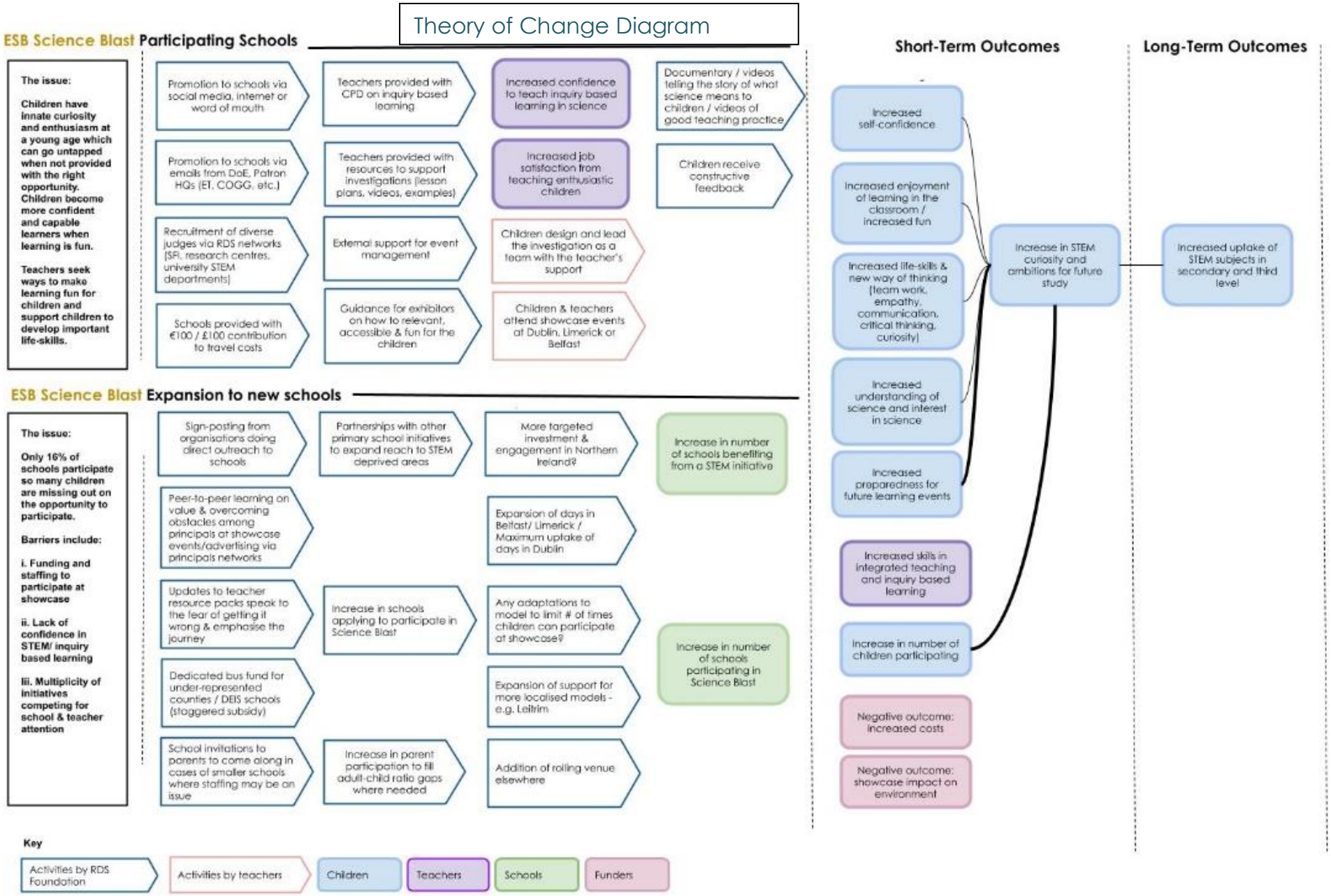
33. What types of resources would help you get the most out of ESB Science Blast in future years? (e.g. lesson plans/webinars, etc.) and what topics would be helpful to cover? (e.g. inquiry based learning/survey design/measurement/integrating maths).

34. Is there anything else that needs to be done to make the event more inclusive of children of different backgrounds, genders and needs?

35. What would keep your class excited and enthusiastic about STEM next year/in future years?

36. Do you have any other feedback on how the programme could be adapted to sustain and deepen its impact in future?

Theory of Change Diagram



The best bits about Science Blast: Children's voices.



Experience of the RDS showcase: Children's voices.



Suggestions for improvement: Children's voices.

Maybe give more space for the projects and clean the floors?

I think there should be a clock, the food to be cheaper and more shows, but overall it was a great event.

I think it's really good but the queues to the stalls were really long.

More activities & free food.

I think they should have more exits.

Maybe more stands.

I think it was super good but it was really loud and not very sensory friendly.

It was very fun but sometimes it was hard to get through crowds.

I think the area should be arranged by class or age but other than that I loved it.



Enthusiasm for Science: Children's Voices.

