



**Science Skills Academy – Interim Review**

**Report  
for  
Highlands and Islands Enterprise**

**November 2021**



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| Report completed/submitted by: | Susan Staiano, Richard Weaver |
| Proof check completed by:      | Lee Williamson                |
| Date:                          | 2 November 2021               |
| Report reviewed by:            | Susan Staiano                 |
| Date:                          | 2 November 2021               |

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# 1 Introduction

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## Introduction

1.1 ekosgen was commissioned in May 2021 by Highlands and Islands Enterprise (HIE) to review the work of the Science Skills Academy (SSA) in promoting STEM to young people and delivering STEM support to practitioners. The SSA project is funded under the ten-year Inverness and Highland City Region Deal and is expected to run until December 2022, with a possible extension to March 2023.

1.2 The SSA project aims to redress the shortage of skills relating to STEM disciplines, and is a long term, innovative and ambitious programme aiming to encourage more young people to study STEM and have the skills to enter employment in STEM sectors and raise awareness of STEM-related careers. Core delivery has been the provision of STEM learning in Newton Rooms across the Highlands, and has latterly included the delivery of professional learning and training for teachers in response to the COVID19 pandemic and its accompanying restrictions imposed on schools.

## STEM education and context

1.3 Covering Science, Technology, Engineering, and Maths, STEM education comprises a very wide range of subjects and skills. These subjects and skills then cut across a number of sectors and it could be argued that they affect virtually every aspect of our lives. To illustrate, STEM is evident across a range of sectors and disciplines – for example, civil and other types of engineering; human health; architecture and construction; biological and chemical sciences; energy and power; life sciences; manufacturing – not to mention digital technology. Without a sound skills base and healthy pipeline of STEM skills, the economy of the Highlands and Islands would be at a distinct disadvantage.

1.4 STEM-related jobs are forecast to expand much faster than jobs in other fields, yet there is a lack of available people with the required level, mix and types of skills. There is a general consensus that Scotland needs to increase the availability of and critically, engagement in STEM education in order to produce the young talent to drive the expansion and development of STEM-related enterprises and attract investment to Scotland. Addressing gender and other inequalities – particularly on the basis of geography and, importantly for the Highlands, remoteness – is a key element of this.

1.5 There are a number of actions and strategies in place that are working towards addressing inequalities in STEM, for example, the Equalities Action Plan for Modern Apprenticeships (MAs) in Scotland and the introduction of Graduate Apprenticeships in STEM-related Frameworks, Equate Scotland<sup>1</sup> and Women in Technology Scotland.<sup>2</sup> There is also a strong policy focus on closing the educational attainment gap and the poverty-related gap is wider in Sciences and Maths than it is in English or languages. Again, if this is not tackled, it will work against the Inclusive Growth agenda and effectively exclude a raft of people from accessing the opportunities in STEM.

1.6 Projects such as the SSA go some way to addressing issues of equity and equality, by encouraging expansion of and engagement with STEM education and learning. It is important to gauge just how successful these types of projects are in achieving this.

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<sup>1</sup> <http://www.equatescotland.org.uk/>

<sup>2</sup> <http://www.womenintechscotland.com/>

## Interim review objectives

1.7 At this point in the SSA project's lifespan, it is important to take stock of delivery to date, review strengths and challenges, and inform future delivery to the end of the project and beyond. The interim review therefore has the following objectives:

- Test the rationale for the SSA and review the current STEM landscape and the changes within this since the SSA launched, as well as future direction;
- Understand the effectiveness of the SSA in engaging with young people in STEM with a clear account of progress to date, including effectiveness and impact of project delivery;
- Examine the impact of the SSA in extending the reach of STEM activities and resources, and developed partnerships to drive engagement and awareness; and
- Consider future delivery of the project, including the suitability of the SSA model of delivery, an assessment of the impact of COVID-19 and recommendations and key priorities for ongoing activity within the life of the project, and for follow-on activity.

## Study methodology

1.8 The evaluation methodology has consisted of the following elements:

- A desk review of secondary sources, including the wider STEM policy environment and changes in STEM education and professional learning driven by the COVID-19 pandemic;
- A review and analysis of project documentation and monitoring information to understand how the project has been delivered in practice and its performance to date against the priorities and targets for the project;
- Consultations with **25** stakeholders, project staff, project board members and practitioners from across 12 different organisations, to gain strategic and operational perspectives on the project's delivery, effectiveness and ambitions; and
- The delivery of an online survey to practitioners to understand their thoughts and experiences of the STEM professional learning received (**12** responses with an **92%** completion rate).

## Methodological challenges arising from the COVID-19 pandemic

1.9 There were a number of challenges in conducting the evaluation which required attention and a re-scoping of the original methodological approach. The evaluation initially aimed to conduct focus groups with practitioners that had benefitted from SSA engagement and follow up with additional schools through an online survey with similar lines of enquiry. However, pressure on teachers and practitioners arising from the impact of the COVID-19 pandemic, the closure of schools and move to remote working at various points during 2020 and 2021, and the subsequent teaching and well-being demands upon returning to classroom-based learning that this brought for key school staff, presented significant challenges for engaging with STEM teachers and practitioners through the fieldwork.

1.10 As a result, the interim review's methodology was modified in agreement with HIE to one-to-one consultations with practitioners who were available, and the remaining practitioners were sent the online survey. However, for the reasons outlined above, there was a low level of engagement in the research.

## Report structure

1.11 The report is structured in the following way:

- **Chapter 2** provides the current policy and delivery context for STEM education, including STEM participation in the Highlands and Islands.

- **Chapter 3** describes the SSA project, including aims and objectives and an analysis of programme performance against targets and indicators.
- **Chapter 4** draws on the findings from the in-depth consultations with stakeholders and project staff and reports on the effectiveness of the management and delivery of the SSA to date.
- **Chapter 5** consider the factors which will influence the future focus and direction of the SSA as the City Region Deal funding period comes to an end.
- **Chapter 6** draws conclusions on the key learning from the SSA STEM project and makes recommendations to enhance the impact and effectiveness of during the remaining delivery period and presents a number of considerations for future project business planning.
- **Appendix 1** provides a list of consultee organisations.

## 2 The current context of STEM education

### Introduction

2.1 This chapter sets out the policy context for STEM in Scotland and the Highland Council region. It discusses the challenges relating to engagement, participation and achievements in STEM education, including the impact of the COVID-19 pandemic. It also considers STEM in the Highlands and Islands region and provides a summary of STEM education and attainment.

### The STEM policy context

#### Importance of STEM

2.2 Across the world, Science, Technology, Engineering and Mathematics (STEM) are recognised as being increasingly important to economic growth and development, driving high levels of productivity and innovation. STEM comprises a very wide range of subjects and skills that cut across a number of sectors, affecting almost every aspect of our lives. This highlights a need to ensure education and employment opportunities across the country align with these developments, giving Scotland a competitive position in the changing global markets.

2.3 The importance of STEM is evidenced in a number and variety of policy documents and initiatives dedicated to its development. Scotland's Economic Strategy (SES)<sup>3</sup>, published by the Scottish Government in March 2015, aims to create a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth and ensuring that everyone in Scotland has the opportunity to fulfil their potential. The focus on outcomes and a whole economy approach led to the development of an economic framework for Scotland which is centred on two pillars: increasing competitiveness and tackling inequality.

2.4 The SES has four priorities to achieve this: investment, innovation, inclusive growth, and internationalisation. STEM industries and skills are particularly important for encouraging innovation and the development of business and are integral to improving digital skills and capacity.<sup>4</sup> The development and improvement of STEM education and training contributes particularly to innovation and inclusive growth:

- **Innovation:** raising the level of STEM skills will mean that this particularly innovative and competitive sector can continue to grow and develop in Scotland.
- **Inclusive growth:** approaches and actions for reducing inequalities within STEM education and training, meaning that STEM can become a growth area that is accessible, providing economic benefits and jobs across Scottish society.

#### The STEM Education and Training Strategy

2.5 The STEM Education and Training Strategy was published in 2017 by the Scottish Government and is integral to their broader economic strategy. It aims to build capacity to deliver *excellence* in STEM learning, close *equity* gaps in participation and attainment, *inspire* young people and adults to study STEM, and provide better *connection* between stem education and training in accordance with the labour market. The strategy seeks to address the way in which education and training can be improved to meet the growing demand for STEM skills and ensure that the STEM skills supply can meet the

<sup>3</sup> Scottish Government (2015) *Scotland's Economic Strategy*

<sup>4</sup> <http://www.gov.scot/Topics/Economy/EconomicStrategy>

demand and contribute to growth. As per the STEM Strategy third annual report<sup>5</sup>, these aims have remained the same since they were set out four years ago.

2.6 A cross-cutting theme of the STEM strategy is to address inequalities in engaging with STEM education amongst disadvantage groups, particularly around the participation of women, minority ethnic communities, disabled people, and those who are care experienced and from disadvantaged backgrounds. Addressing issues equality and equity of access that arise due to geographical barriers in rural and remote areas is also of importance.

2.7 The STEM Education and Training Strategy has been designed to integrate with and support a range of national policies and programmes to achieve the aims and objectives. The National Improvement Framework (NIF)<sup>6</sup> sets out the vision and priorities for Scottish education and the activity that needs to be undertaken to help deliver those key priorities. This complements the ongoing implementation of Curriculum for Excellence (CfE), Getting It Right for Every Child, and Developing the Young Workforce (DYW), which are the three supporting pillars of the Scottish education system.

2.8 Specific policy implementation includes focus on the development of better STEM education through improving practitioner recruitment, learning and promotion of STEM for education and employers and young people. Extending provision of information around STEM in school careers advice and promoting links between schools and STEM employers is another key action.<sup>7</sup> Enhancing practitioner learning and the use of the digital technology strategy can enhance and equip children and young people with the digital skills they need for improved educational outcomes.

## A changing policy context

2.9 Since the STEM Strategy was published, new steps have been set out in consecutive Programmes for Government published by the Scottish Government. The Scottish Government's Programme for Government (2019-20)<sup>8</sup>, set out actions for taking advantage of the economic opportunities offered in the STEM sector to address the climate emergency. Building on the COVID response- and climate emergency-related actions in the 2020-21<sup>9</sup> Programme for Government, the new 2021-2022 Programme for Government<sup>10</sup> highlights the integral role STEM education and skills play in meeting the demand for green skills and delivering against the Climate Emergency Skills Action Plan (CESAP).

2.10 The STEM Education and Training Strategy has a vital role in working towards these ambitions, driving innovation and growth for the present, near and distant future. However, the STEM Education and Training Strategy is due to be reviewed during Autumn 2021, which will dictate the direction of travel for future delivery of the Strategy.

2.11 Further, the recently published OECD review of CfE and the forthcoming review of Education Scotland and SQA, due for completion in Spring 2022, will provide an important context in which to consider future STEM delivery. Additionally, the Scottish Government has commenced the development of its 10-year Economic Transformation Strategy and aligned sub-strategies for COVID-19 recovery and innovation. These will undoubtedly have significant implications for the future delivery of STEM education and training.

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<sup>5</sup> Scottish Government (2021) STEM strategy for education and training: third annual report

<sup>6</sup> Scottish Government (2019) *National Improvement Framework and Improvement Plan: summary document*

<sup>7</sup> <http://www.gov.scot/Publications/2016/11/4147>

<sup>8</sup> Scottish Government (2019) *Protecting Scotland's Future: The Government's Programme for Scotland 2019-2020*

<sup>9</sup> <https://www.gov.scot/publications/protecting-scotland-renewing-scotland-governments-programme-scotland-2020-2021/>

<sup>10</sup> <https://www.gov.scot/publications/fairer-greener-scotland-programme-government-2021-22/>



## STEM and the Highlands

### Barriers to STEM education and training in Highland

2.12 Within STEM education and employment, there is the challenge of representation in: gender and age; people from ethnic backgrounds; those living in deprived areas; and disabled or care-experienced. In the Highlands, there is also the challenge of rurality and remoteness across a large local authority area, and the specific barriers to access this creates. These include small schools with composite classes, low population (and thus school population) density, and large distances to science centres in Scotland's cities. Whilst the STEM Education and Training Strategy is not concerned with the makeup of the existing workforce, considering how to better engage under-represented groups and enable access to STEM education and employment is within its scope.

2.13 Research undertaken by Kings College London's [ASPIRES research] shows that these disadvantaged groups are all adversely affected by a lack of 'science capital' (science-related qualifications, understanding, knowledge about science and 'how it works', interest and contacts) in the household growing up. This means that people from these backgrounds are less likely to choose STEM-related subjects and therefore less likely to consider a STEM career.

2.14 Ensuring fair access is important to increase equality across STEM education and employment. Individuals growing up or working in disadvantaged areas may experience broader limitations in access to STEM education and training opportunities. The availability of STEM education pathways may be limited by what the school, regional college and local partners can offer. As noted above, this is a particular challenge in smaller rural schools typically located in Highland. This in effect narrows the educational opportunity for learners to study STEM subjects, and consequently pursue employment opportunities in the area that demand STEM skills and qualifications. This is a factor in terms of talent retention (and attraction) in Highlands and the wider region. Anecdotal evidence also indicates a barrier in the region's ability to attract and/or recruit STEM teachers.

### Strategic context

2.15 Both nationally and with the Highland area, there is complex landscape in STEM education and professional learning support provision, and also in the strategic structures that underpin this activity. This crowded landscape is in part considered to be the case because of the wide-ranging nature of STEM, and the overlapping remits and interest that each organisation involved has. Within Highland, there is a mix of national, regional and local STEM education structures, but it is arguable that there is limited alignment in terms of geography and remit.

2.16 Local authorities and schools in Scotland have taken a lead in disseminating approaches to STEM learning and teaching to their cluster schools. In Highland, this is done according to the established Associated School Groups (ASGs).

2.17 Schools are supported by Regional Improvement Collaboratives (RICs). These bring together a range of professionals across local authorities, Education Scotland and other education and health experts, in order to provide ongoing support for teachers and other school staff working with children and young people with the aim to improve wellbeing, attainment and outcomes. Each is designed to deliver targeted support to schools based on specific needs, including around STEM learning and access. The Highland area falls within the remit of the Northern Alliance, which covers the Highlands and Islands and Aberdeen City and Shire.

2.18 The Raising Aspirations in Science Education (RAiSE) Programme is also delivering to schools in the Highland area. The RAiSE Programme began in 2016 as a £2 million pilot, and aims to enhance the confidence and skills of primary school practitioners to improve learning and teaching in STEM education, aligning with both the STEM Education and Training Strategy and the DYW programme. It is led by Education Scotland and is being funded through a partnership between the Wood Foundation, Scottish Government and participating local authorities. Its ultimate ambition is to raise attainment and

achievement in primary science and STEM, and tackle inequity and inequality in learners' experiences and their potential to achieve. Whilst part of the original Pilot, Highland Council no longer has dedicated RAiSE Officers.

2.19 Education Scotland are also delivering the STEM Professional Learning Grants Programme nationally, and the three rounds that have been run to date have seen a number of Highland primary and secondary schools participate in project delivery.

2.20 There are also STEM-focused activities being delivered by the Developing the Young Workforce (DYW) groups in Highland – Inverness & Central Highland, North Highland, West Highland – in addition to the work of the STEM Ambassador Hub. This has recently moved from a three-hub model in Scotland with Aberdeen Science Centre covering the North of Scotland, to a single STEM Ambassador Hub for the whole of Scotland.

2.21 In addition, the SSE Renewables Highland Sustainable Development Fund-supported UHI STEM project is using a combination of outreach activity and CLPL to deliver STEM education and engagement activity. This was also supplemented by the creation of a STEM Hub on UHI's campus in Inverness. This was a £500,000 project funded through SSE, which took place over five years and ended in September 2021. Skills Development Scotland also maintained a physical space in Inverness for STEM-related activity.

2.22 UHI also lead on the Regional STEM Partnership in Highland. Regional STEM Partnerships were originally established as College STEM Hubs, managed in partnership with the Energy Skills Partnership (ESP).

2.23 The STEM industry position in the Highlands and Islands is growing. Across the region, between 2017 and 2021 there was an increase in the number of businesses in STEM-related sectors<sup>11</sup> such as Electricity, gas, steam and air conditioning supply (+7%), Manufacturing (+6%), Construction (+6%), and Information and communication (+1%)<sup>12</sup>. With the exception of Electricity, gas, steam and air conditioning supply, growth in these sectors was greater in the Highlands and Islands than it was across Scotland as a whole – the number of Information and communication businesses declined across in Scotland over the period (-9%). The region also saw an increase in employment in the Information and communication (+14%), Professional, scientific and technical (+10%), and Construction (+7%) sectors between 2018 and 2019, again all proportionally greater than the increases at Scotland level<sup>13</sup>.

## STEM education and attainment<sup>14</sup>

2.24 This section presents a trend analysis of education enrolment and attainment in STEM for Highland and Scotland. Analysis is presented across several different education levels, including school, college, apprenticeships, and university (as far as possible as data will allow).

2.25 Figure 2.1 shows the overall indexed trend in STEM education and attainment in Highland between 2017 and 2020<sup>15</sup>. There has been a fall in the number of entries at Higher and Advanced Higher level in Highland, but a rise in the number of National entries (up 3%). Higher entries in Highland fell fairly significantly across the period, down 10%. However, despite this, there has been an increase in the number of passes across all three levels, particularly at National and Advanced Higher, with both rising 14% between 2017 and 2020<sup>16</sup>. The trend in school STEM provision across Highland largely

<sup>11</sup> STEM-related sectors are typically considered those where at least 15% of the sector's workforce are STEM qualification holders and where the sector as a whole employs at least 0.06% of the core STEM workforce (0.1% for medical STEM sectors)

<sup>12</sup> UK Business Counts, 2021

<sup>13</sup> Business Register and Employment Survey, 2021

<sup>14</sup> Data analysis was undertaken using the definition of STEM education used in the Scottish Government's STEM Education and Training Strategy and supporting evidence base. The summary of analysis presented here captures the broad trends and challenges around STEM education that are evident in the Highland area.

<sup>15</sup> 2017 data is for August, whereas 2018-2020 is for December – this is due to SQA's data publishing process

<sup>16</sup> A school pass is considered to be a grade of A-C

reflects the national picture, where there was fall in entries but an increase in passes at all levels between 2017 and 2020.

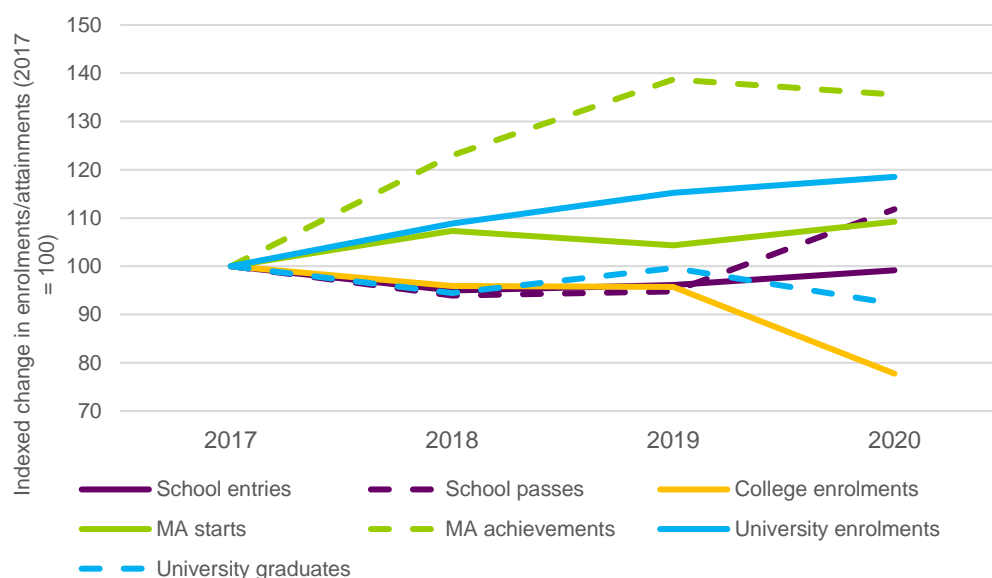
2.26 While the fall in Highland school entries may be partly explained by a decrease in school pupil population (the number of individuals aged between 15 and 19 fell by 4% in Highland between 2016 and 2020), and curriculum/examination changes (i.e. at National level), the rise in passes is almost entirely due to a change in the assessment process in 2020 as a result of the COVID-19 pandemic.

2.27 There has been a significant fall in FE college STEM provision in the Highlands and Islands since 2017, with entries falling 22% over the period. Conversely, STEM provision rose at university in Highland between 2017 and 2020, with enrolments on STEM-related courses in the area increasing by 19%. This may indicate a higher number of young people opting to undertake STEM studies at university level rather than college level across Highland and the wider Highlands and Islands region. It differs from the national trend, where college entries rose 6% between 2017 and 2020. University entries also rose across Scotland (up 8%), however this was at a lower rate than Highland.

2.28 Despite the rise in university STEM enrolments in Highland between 2017 and 2020, there was a fall in the number of graduates over the period (down 8%). Again, this was the opposite of the trend at Scotland level, where STEM graduates rose 4%. However, it is true that many young people domiciled in Highland and the wider Highlands and Islands area complete their studies in, and will therefore graduate from, other universities across Scotland.

2.29 Data on uptake of STEM-related Modern Apprenticeship frameworks in Highland was not available at the time of reporting, however Figure 2.1 indicates a general upward trend in starts and achievements across Scotland.

**Figure 2.1: Overall indexed trend in STEM education and attainment, Highland<sup>17</sup> (2017 to 2020)**



Source: SQA, SFC, SDS and HESA<sup>18</sup>, 2021. Please note trends are indexed from 100 in 2017

2.30 Table 2.1 shows the number of entries and attainments across each education level in Highland from 2017 to 2020. Please note, due to data suppression across particular subjects to avoid disclosure issues, school entry and attainment figures presented may be slightly lower than the actual figures.

<sup>17</sup> Please note: Modern Apprenticeship data for Highland was not available, therefore MA data in Figure 2.1 is for STEM-related frameworks in Scotland as a whole

<sup>18</sup> Scottish Qualifications Authority (SQA), Scottish Funding Council (SFC), Skills Development Scotland (SDS), and Higher Education Statistics Agency (HESA)

2.31 There were 11,285 STEM-related school entries across Highland in 2020, representing 4% of all school entries in STEM-related subjects across Scotland. Similarly, the number of Highland passes at school level in 2020 accounted for 4% of all school STEM passes in Scotland. As a proportion of the overall Scottish STEM entries and passes, Highland remained at this same level between 2017 and 2020.

2.32 Highland college enrolments were 3,902 in 2020, representing 5% of all STEM college entries in Scotland. This continued a downward trend in Highland college entries as a proportion of all college entries in Scotland between 2017 and 2020, down two percentage points across the period.

2.33 There were 3,810 university enrolments in STEM-related courses in the University of the Highlands and Islands in 2020, accounting for 3% of all STEM-related university enrolments in Scotland. This proportion has remained the same since 2017. The proportion of STEM passes in the University the Highlands and Islands was 4% of all Scottish STEM passes in 2020, again remaining at the same level as 2017.

**Table 2.1: Number of STEM education enrolments and passes, Highland (2017-2020)**

| Education level       | 2017   | 2018   | 2019   | 2020   | % change 2017-20 |
|-----------------------|--------|--------|--------|--------|------------------|
| School entries        | 11,382 | 10,810 | 10,942 | 11,285 | -0.9%            |
| School passes         | 8,799  | 8,264  | 8,341  | 9,838  | 11.8%            |
| College enrolments    | 5,019  | 4,813  | 4,802  | 3,902  | -22.3%           |
| MA starts             | 9,619  | 10,325 | 10,038 | 10,507 | 9.2%             |
| MA achievements       | 6,076  | 7,473  | 8,427  | 8,239  | 35.6%            |
| University enrolments | 3,215  | 3,500  | 3,705  | 3,810  | 18.5%            |
| University graduates  | 1,350  | 1,275  | 1,345  | 1,245  | -7.8%            |

*Source: SQA, SFC, SDS and HESA, 2021*

## Summary

2.34 The current policy context around STEM education and training aims to raise awareness of its importance to the Scottish economy, and in responding to the climate emergency and COVID-19 recovery. The STEM Education and Training Strategy underpins activity designed to remove barriers to engaging with STEM education, especially for disadvantaged groups and for those facing spatial barriers.

2.35 Geography and the nature of Highland is a particular challenge for learners and practitioners wanting to engage with STEM education and training. Analysis of STEM education data provides a mixed picture for enrolment and attainment in STEM subjects in Highland overall. Whilst there are promising signs in terms of increasing attainment, enrolments at school, FE and HE level have been decreasing.

2.36 The Science Skills Academy (SSA) project aims to address the challenge of engagement and participation in STEM education and training. The SSA project and its performance to date is covered in more detail in Chapter 3.

## 3 Science Skills Academy

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### Introduction

3.1 This chapter examines the SSA project in detail with a summary of the project, delivery model and performance to date. It presents project delivery, including the number of schools and learners engaged and session delivered, as well as a break down by Highland Area Education Office.

### Project overview

3.2 The SSA project secured funding in April of 2017, and was originally intended to run until March 2022, with a possible one-year extension. Project delivery was extended to December 2022 as a result of the COVID-19 pandemic, with potential to extend until March 2023. The project is funded under the ten-year Inverness and Highland City Region Deal. The City-Region Deal<sup>19</sup> aims to transform the Highland economy and with a vision of being a region of digital opportunity. It has £315 million of funding, consisting of £135 million from the Scottish Government £127 million from the Highland Council and partners, and a further £53 million from the UK government. The City-Region Deal has three broad thematic priorities including *a growing economy, enabling the economy, and a skilled economy*.

3.3 As is the case nationally, the Highlands and Islands region has skills shortage in STEM. There are also widespread concerns about the future supply of well-qualified and highly skilled scientists and technicians. These high-quality jobs are expected to increase in sectors such as life sciences and renewable energies and the workforce must be equipped to fill these jobs and contribute to the economic growth and prosperity of the region. These sectors are also key priorities as per the Scottish Government's economic strategy, evidencing Scotland's expertise and potential for growth. There is also a deficit of young people in the Highlands and Islands region, due to factors such as education, training, and employment opportunities, lack of housing, poor transport infrastructure and digital connectivity. Although this deficit is decreasing, there continues to be a lack of sufficiently skilled workforce for STEM employers in particular, in the region.

3.4 The SSA received £3 million of funding to invest from 2016/17 to 2021/22. The aim of the project is to encourage more young people to study STEM in school and beyond, develop STEM skillsets and raise awareness of STEM careers. Its overarching vision is "to make the Highlands and Islands a region of excellence where the skills and aspirations of our young people are matched to the growth of science and technology based sectors". It looks to promote STEM to young people and deliver STEM support to practitioners to redress the shortage of skills in these disciplines, providing the skills to enter employment in STEM sectors, particularly the new job opportunities opening up in the Highlands and Islands region. The seven objectives of the SSA project are:

1. Increase the proportion of young people engaged in STEM and raise attainment while building career prospects;
2. Increase STEM career awareness across pupils, parents, carers and teachers;
3. Develop new delivery model(s), integrating school, FE and HE provision to meet employer needs and ensure equity of access across Highland;
4. Fully engage employers, communities, parents, carers and teachers;
5. Extend the reach of existing STEM activities promoting young people's engagement and enhancing the use, reach and impact of existing support and resources;

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<sup>19</sup> <https://www.highland.gov.uk/cityregiondeal>

6. Transform the scale and nature of investment through partnership development; and
7. Identify and overcome barriers and gaps in support and resources.

3.5 The SSA project aimed to meet these objectives through the set up and delivery of five Newton Rooms over three to four years to give children and young people a good learning experience in STEM. These aim to help to build the vision of a sustainable pipeline of skills that are important to a modern and successful economy in key growing sectors in the Highlands region. These objectives also align with the themes of the Highlands and Islands Regional Skills Investment Plan, particularly in building a region for young people, meeting current skills needs for employers, and planning for the future.

3.6 The SSA have delivered the project to date through a collaborative partnership approach in establishing the Newton Room network and working with local schools and businesses in each local area across Highland. The SSA's Project Board includes HIE, Highland Council, UHI, Skills Development Scotland, NHS Highland and High Life Highland.

## The delivery model

### The Newton Room concept

3.7 The Newton Concept is owned, developed and managed by the non-profit foundation FIRST Scandinavia. Since 2000, FIRST Scandinavia has developed and implemented STEM concepts and projects for over 500,000 children and young people. FIRST Scandinavia started the development of the Newton concept in 2003, as a result from lack of hands-on activities, outdated equipment and shortage of resources for science laboratories in the Norwegian schools. The first rooms opened in 2007, and today there are 40 operating Newton rooms in Norway. The first international room opened in Denmark in 2015, and two rooms were established in Scotland, in Highland in 2019. Since then a number of Newton Rooms have opened across Europe including an international team set up in Berlin to support their wider growth strategy.

3.8 Newton Rooms aim to be an appealing and inspiring learning environment. Individual settings and conditions help to make each Newton Room unique. The overarching goal is always functionality and outstanding quality. A Newton Room usually consists of a main room with workstations, an auditorium/amphitheatre (collaboration zone) for group discussion and reflection, a lab area, a storage room, a coatroom, and a workplace/office for the Newton Teachers. FIRST Scandinavia offer recommendations on how the rooms should be laid out, placing emphasis on the utilisation of bright colours, sound and lighting to help create "dynamic and inspiring" learning sessions.

3.9 The long-term goal of these projects is to inspire more young people to become interested in STEM subjects and encourage them to study these subjects in school and beyond through high quality, hands on science-based activities. There can be one or more teachers affiliated with the space, teaching visiting classes from three-hour lessons to several days. As well as school lessons, they can also be used on evenings, weekends and holidays for other science related activities such as teacher training, family and public events and business events.

### SSA delivery model

3.10 The SSA was designed as a hub and spoke model with the SSA central team dealing with overall strategy, development and maintaining an overview of quality and best practice. The spokes are the Newton Rooms where the delivery of high quality, hands on science-based activities are delivered by STEM Engagement Officers. At each Newton Room there are local partnerships to ensure that community involvement and local requirements are prioritised within the framework of the SSA. The focus and content of delivery activity within the Newton Rooms consist of modules developed to match STEM sectors in the Highland region, which complement the Scottish Government's Curriculum for



Excellence and the Scottish STEM Strategy, all whilst targeting locally important sectors like aquaculture and renewable energy, life sciences, and peatlands.

3.11 All delivery content aims to increase awareness of and career opportunities for young people in STEM.

3.12 The SSA model currently consists of four Newton Rooms and one pop-up/mobile facility, the former located in community or education centres across the region, as listed below:

- Thurso Newton Room – North Highland College, opened March 2019
- Fort William Newton Room – Caol Youth Centre, opened April 2019
- Dingwall Newton Room – Dingwall Town Hall, opened in December 2020 (originally scheduled for end 2019)
- Inverness Newton Room – UHI STEM Hub, An Lòchran campus (initially a shared facility with a UHI STEM project; SSA is now the sole user since August 2021)
- Pop-up – Skye and Lochalsh, Badenoch and Strathspey, and Inverness (delivery commenced in August 2021)

3.13 There are seven SSA staff – five STEM Engagement Officers delivering in Newton Rooms and two central office staff - across these five locations, each with a strong STEM engagement background, outside of teaching.

### **Delivery roll-out and impact of COVID-19**

3.14 The SSA's delivery activity commenced in late 2017 with a small number of sessions delivered from a mix of community centres across the Highland region as the project had yet to establish its Newton Rooms. As the project was still to recruit its STEM Engagement Officers sessions were delivered by a number of partners, e.g. NHS Highland and the SSA project Manager. 15 sessions in total were delivered till the end of 2018. The first two Newton Rooms were opened in early 2019 and delivery commenced in earnest with the appointment of the STEM Engagement Manager. By January 2020 all five STEM Engagement Officers had been recruited and a third Newton Room and Pop-up came on stream in the latter part of 2020 and summer 2021 respectively.

3.15 Due to the national lockdown in March 2020 and the associated ongoing restrictions with the COVID-19 pandemic till September 2020, the SSA project was not able to deliver activity as initially planned. The pandemic put great pressure on the education system as a whole. Periods of full lockdown and restrictions required high levels of adaptation and flexibility within education to allow as many people as possible to continue their STEM learning. It created a need for the design of new learning and teaching delivery models to respond to high levels of remote working and restricted numbers in schools which adversely affected the delivery of SSA activities in the Newton Rooms. The SSA team responded during much of 2020 by developing online materials and resources that teachers could use to engage learners. These included digital downloads including presentations, quizzes and interactive resources for pupils. 170 schools also took receipt of Maths or Space Boxes which included lesson plans and materials for experiments etc. The team also used the time to develop new Newton Room modules. Post the January-March 2021 lockdown, the SSA team turned to the delivery of online CLPL sessions for teachers as well as delivering some outdoor learning for P3-7.

3.16 As schools began to return to some day-to-day normality after Easter 2021, delivery to pupils restarted in an outdoor school setting. Delivery in Newton Rooms did not start again until August 2021. COVID also impacted on the ability to engage teachers in primary research as part of this interim review resulting in the low levels of engagement with the research, as it was challenging to engage with secondary school teachers at this time which was approaching the end of the 2020/21 term.

3.17 The impact of COVID-19 meant that for some 18 months the SSA delivery model had to be rethought temporarily. There was a loss of the local aspect to the SSA project delivery and less of a face-to-face experience in STEM learning. However, it is worth noting that this did present more opportunities for online teacher engagement that may have otherwise not been considered, such as virtual learning sessions and reaching practitioners that otherwise may not have had the time to access CLPL.

## Funding

3.18 The SSA project was provided with a £3 million budget under the Inverness and Highland City Region Deal split across six years. As Table 3.1 shows, there has been a greater increase in spend from 2019 when there was an increase in Newton Room and engagement activities. For the year 2021/22 the Quarter one spend has been £71,075, with a forecast spend of £570,344 for Quarter two to Quarter four. The anticipated forecast spend for 2022/23 until December is £728,024, 24% of the total budget.

3.19 Despite approval in 2016/17, there was no recruitment for the project delivery team undertaken until 2019 although the Project Manager was in post from 2017. There was also a delay in Newton Rooms opening, with Thurso and Fort William opening in 2019, whilst Dingwall opened in late 2020 after being delayed – it was originally due to open in 2019.

**Table 3.1: Project budget**

| Year         | Budget            | Actual Spend (June 2021) |
|--------------|-------------------|--------------------------|
| 2016/17      | £171,000          | £67,857                  |
| 2017/18      | £488,000          | £100,472                 |
| 2018/19      | £620,000          | £370,344                 |
| 2019/20      | £736,000          | £582,658                 |
| 2020/21      | £514,000          | £509,227                 |
| 2021/22      | £511,000          | £641,417 <sup>20</sup>   |
| <b>Total</b> | <b>£3,000,000</b> | <b>£2,271,976</b>        |

*Source: SSA Monitoring data, 2021*

3.20 In addition to this, there has been around £46,000 funding from outwith the City Region Deal, to deliver activity relating to Maths Week and provision of Destination Space STEM kits as well as the procurement of the Newton Module kit for Thurso and Fort William Newton Rooms, a contribution towards the Dingwall refurbishment and some transportation for selected schools to the Dingwall Newton Room..

## Delivery and performance

3.21 This section presents an overview of the STEM sessions and engagements that have been and are being delivered as part of the SSA project.

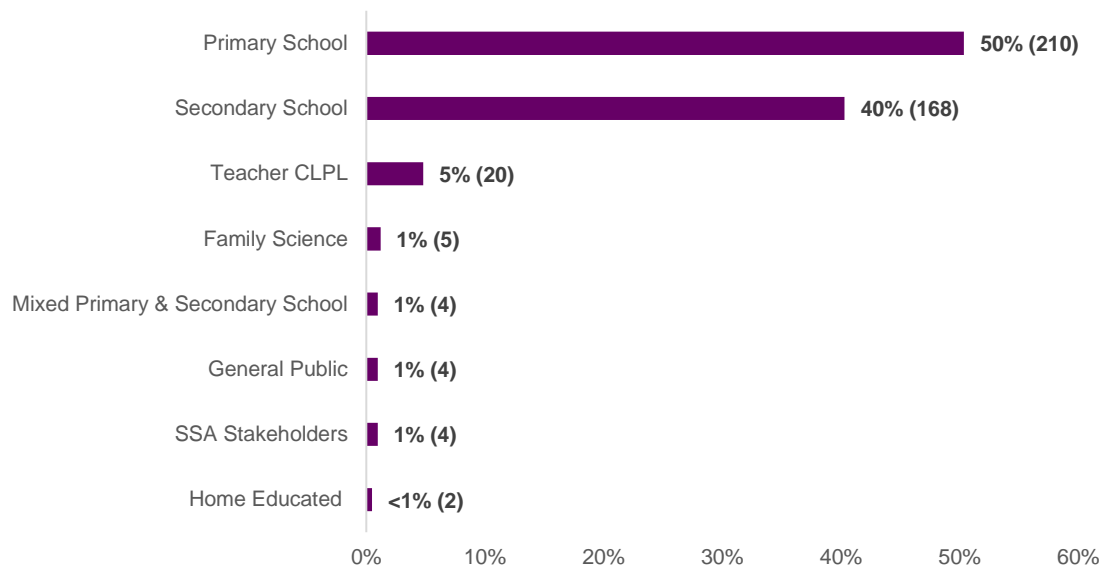
3.22 To June 2021, the SSA project team have delivered 417 sessions across the Highland region. Half (210; 50%) of these sessions were in primary schools, followed by 168 (40%) in secondary schools, with 382 sessions delivered overall to these groups, including mixed primary and secondary school sessions. Five percent of sessions (20 in total) were with STEM CLPL with teachers, and the remaining number were sessions across other groups such as businesses, the general public, and SSA stakeholders (5%).

<sup>20</sup> Includes Q1 actual spend and forecast spend for Q2-4.



3.23 An additional 42 sessions took place in the Newton Rooms that were delivered either externally by other partners (36 sessions) or were business events (6 sessions).

**Figure 3.1: Audience type for sessions, 2016/17 to 2020/21 (N=417)**



Source: SSA Monitoring data, 2021

3.24 At the end of June 2021, the project had engaged a total of 7,962 participants through the 417 sessions delivered. This included 7,051 pupils across primary and secondary school, and home schooling. The majority of participants (over 99%) have been engaged from 2019 onwards. So far, 2019 and 2020 have seen the highest number of engagements overall, each accounting for around one third (36%) of engagements. This is despite the impact of the COVID-19 pandemic in 2020. The number of engagements during 2021 suggests that the number of engagements for 2019 and 2020 may be exceeded, which is promising. However, primary school pupil engagements were highest in 2020, whilst 2021 has seen the highest number of secondary school pupil engagements. The SSA's overall aim is to demonstrate full delivery to almost 10,000 pupils across the whole of Highland in one academic year.

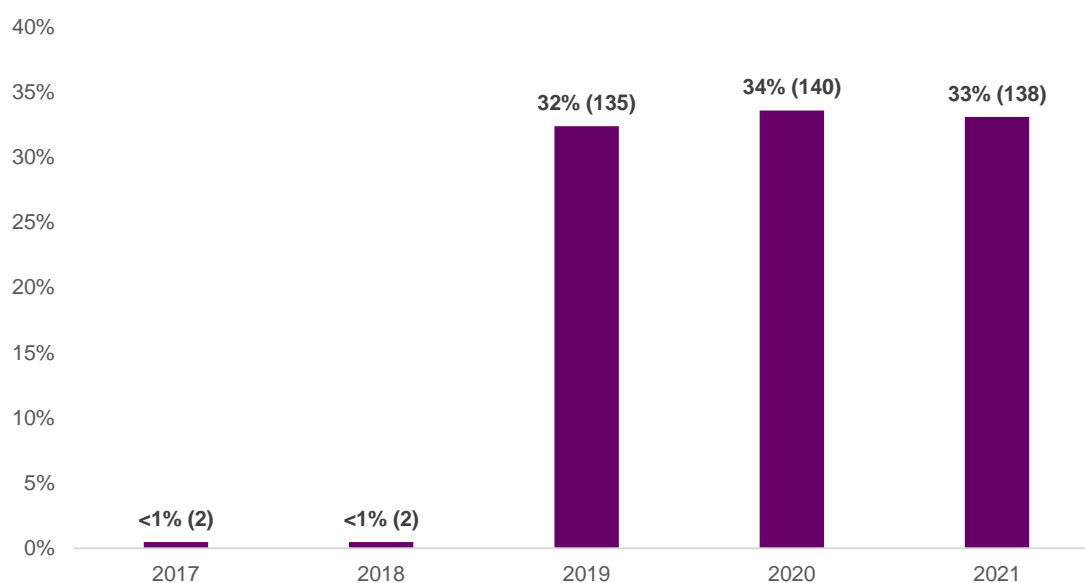
3.25 Around 41% of sessions delivered by the SSA project team were less than 100 minutes in length, with 16% of sessions lasting 100 minutes ('mini modules') and 14% lasting 300 minutes or more (full day activity). Just under one-third of sessions were between 100 and 300 minutes in length. Over half of sessions delivered to primary schools were less than 100 minutes in length (52%), whereas sessions of less than 100 minutes accounted for 22% of secondary school delivery. Secondary schools saw 38% of sessions delivered in 100 minutes, or mini module length.

**Table 3.2: SSA engagement: session participants by audience type**

| Session audience type            | 2017        | 2018        | 2019         | 2020         | 2021         | Total (N)    | Total (%)   |
|----------------------------------|-------------|-------------|--------------|--------------|--------------|--------------|-------------|
| Primary school                   | -           | -           | 1,367        | 1,982        | 595          | 3,944        | 49.5%       |
| Secondary school                 | 31          | 13          | 1,186        | 357          | 1,472        | 3,059        | 38.4%       |
| Teacher CLPL                     | -           | -           | -            | 492          | 119          | 611          | 7.7%        |
| SSA stakeholders                 | -           | -           | 109          | -            | -            | 109          | 1.4%        |
| General public                   | -           | -           | 97           | -            | -            | 97           | 1.2%        |
| Family science                   | -           | -           | 73           | 21           | -            | 94           | 1.2%        |
| Mixed primary & secondary school | 13          | -           | 23           | -            | -            | 36           | 0.5%        |
| Home educated                    | -           | -           | -            | 12           | -            | 12           | 0.2%        |
| <b>Total (N)</b>                 | <b>44</b>   | <b>13</b>   | <b>2,855</b> | <b>2,864</b> | <b>2,186</b> | <b>7,962</b> | <b>100%</b> |
| <b>Total (%)</b>                 | <b>0.6%</b> | <b>0.2%</b> | <b>35.9%</b> | <b>36.0%</b> | <b>27.5%</b> | <b>100%</b>  | <b>-</b>    |

Source: SSA Monitoring data, 2021

3.26 As a result of the delays at the outset of the SSA project, the SSA STEM engagement session (or 'interactions') were predominantly delivered in the latter three years, with 99% of sessions delivered from 2019 onwards. The highest number of sessions were delivered in 2020.

**Figure 3.2: SSA STEM engagement interactions delivered by year (N=417)**

Source: SSA Monitoring data, 2021

3.27 There has been a good distribution of school sessions across the Highland Area Education Office, as shown in Table 3.3. The greatest proportion of schools engaged were in the West Education Office, accounting for 28% of both primary and secondary schools. This was followed by the North Education Office which was where the higher proportion of the secondary schools were (30%). The South and Mid regions also had similar levels of schools engaged with, and less than 1% were online school engagements.

**Table 3.3: Number of schools in each Highland Area Education Office, 2017 to 2021**

| Area Education Office | Primary     |                  | Secondary   |                  | Total schools overall |
|-----------------------|-------------|------------------|-------------|------------------|-----------------------|
|                       | No. Schools | % of all schools | No. Schools | % of all schools |                       |
| West                  | 25          | 28%              | 7           | 26%              | 32                    |
| North                 | 22          | 25%              | 8           | 30%              | 30                    |
| South                 | 18          | 20%              | 8           | 30%              | 26                    |
| Mid                   | 23          | 26%              | 4           | 15%              | 27                    |
| N/A (online)          | 1           | 1%               | 0           | 0%               | 1                     |
| <b>Total</b>          | <b>89</b>   | <b>100%</b>      | <b>27</b>   | <b>100%</b>      | <b>116</b>            |

Source: SSA Monitoring data, 2021

3.28 Up until June 2021, there have been 150 instances of engagement by schools, with some schools engaged in more than one year. There was an increase in engagement levels in 2019, following the initial implementation period. To the end of June 2021, there have been Primary school engagements account for almost three quarters of engagements.

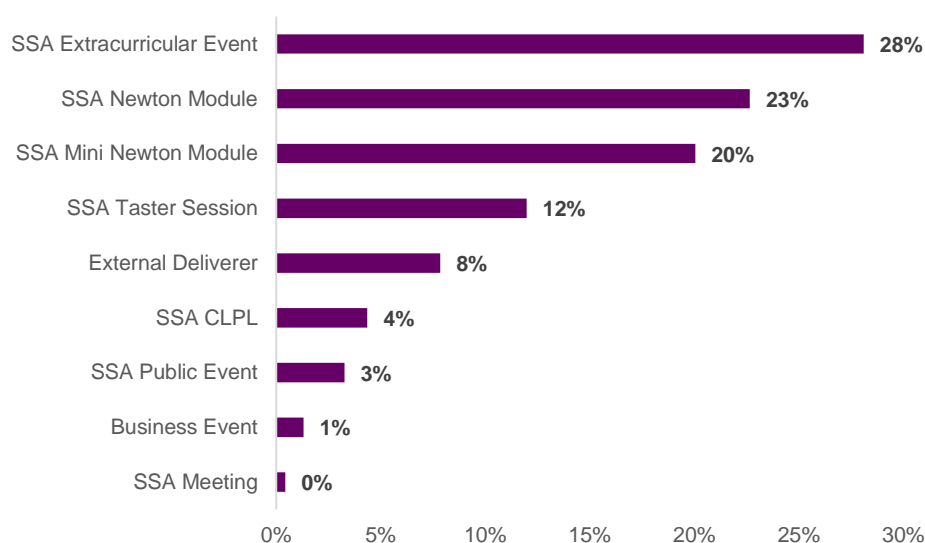
**Table 3.4: Schools engaged by academic year, 2017 to 2021**

| School level | 2017     | 2018     | 2019      | 2020      | 2021      | Total (No.) | Total (%)   |
|--------------|----------|----------|-----------|-----------|-----------|-------------|-------------|
| Primary      | 0        | 0        | 36        | 54        | 20        | 110         | 73%         |
| Secondary    | 1        | 1        | 13        | 5         | 20        | 40          | 27%         |
| <b>Total</b> | <b>1</b> | <b>1</b> | <b>49</b> | <b>59</b> | <b>40</b> | <b>150</b>  | <b>100%</b> |

Source: SSA Monitoring data, 2021

3.29 There was a shift in delivery in the SSA project towards CLPL staff events from September 2020 and into 2021. This was primarily driven by the impact of the COVID-19 pandemic, and the pivoting of project activity towards CLPL during this period. This consisted of 29 CLPL sessions with around 672 participants.

3.30 The project delivered a variety of event types. As Figure 3.3 shows, these were predominantly SSA Extracurricular Events (28%) with around 3,000 participants. The Newton Modules were also common, with 23% Newton Module events and a further 20% for the Mini Newton Module.

**Figure 3.3: Event types**

Source: SSA Monitoring data, 2021

## Performance against targets

3.31 Table 3.5 sets out the SSA's project performance against targets to date. Whilst the project has not established the SSA Hub as originally intended due to a number of factors including the COVID-19 pandemic, it has performed well in terms of the direct project outputs.

3.32 Some of the project's longer-term (and indirect) outcomes do not yet have any monitoring data recorded.

**Table 3.5: Performance against business case outcome targets**

| Indicator   | Performance to date  |
|---|--|
| The creation of the SSA hub   | Achieved – consisting of the core project team including Director/SRO, Project Manager and STEM co-ordinators  |
| The creation of a minimum of 5 Newton Rooms in the Highland Region  | 4 Newton Rooms established, plus pop-up Newton Room. The project business plan contained an objective to establish a purpose-built STEM facility on Inverness Campus; this has not progressed and the Inverness Newton Room operates in the UHI STEM Hub, which has been leased to the end of the project. |
| 9,500 school children attending a Newton Room one day per annum   | 7,311 engaged (June 2021); 77% of target   |
| Increased business investment in developing a pipeline of skills for the science, technology, engineering and digital sectors | No data  |
| Numbers of external users of SSA facilities   | 36 external deliverers<br>6 business events  |
| Numbers of school children taking/passing STEM D examinations   | 2018: 8,264<br>2019: 8,341<br>2021: 9,838  |
| School leaver destinations to STEM D FE/HE and employment   | No data  |
| Reduction in STEM D vacancies deemed 'hard to fill'   | No data  |
| Increase in STEM D jobs   | No data  |
| Increase in technology start-ups  | No data  |
| Increase in the numbers of inward investing (STEM D) companies attracted  | No data  |

## Summary

3.33 The SSA project aims encourage more young people to study STEM in school and beyond, develop STEM skillsets and raise awareness of STEM careers. Through its Newton Room model, it has delivered a range of engagement sessions to pupils, practitioners and stakeholders. Despite delays experienced at the outset of the project, and significant disruption as a result of the COVID-19 pandemic, the SSA project has performed well against some of its intended targets.

3.34 The project has established four Newton Rooms, along with pop-up Newton Rooms across the Highland Council area. More than 8,500 participants have been engaged in the project so far. Over 7,300 pupils have been engaged in STEM sessions, along with 672 practitioners through CLPL sessions.

3.35 The project has performed well against some of its stated targets. However, further data collation and monitoring will be required to report against some of its wider intended outcomes as part of an evaluation.

## 4 Project management and delivery

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### Introduction

4.1 As set out in Chapter 3, the SSA project has engaged with a considerable number of schools and pupils to date. Whilst this has been impacted by the COVID-19 pandemic in particular, there is a sense that project delivery so far has been relatively strong. The SSA team has also used the COVID-impacted period to establish a full operational model which was in place when schools re-opened in August 2021. This chapter examines project management and delivery for the SSA, examining strengths and challenges, considering impacts and benefits that have been observed, and setting out considerations for future operational delivery.

### Management and delivery strengths and successes to date

#### Geographical coverage

4.2 Consultees consider that a key strength of the project is a real ability and commitment to serve a Highland-wide area, and acknowledging the diversity of the area in doing so. The direct engagement with schools and enabling of access across more rural and remote areas has underpinned a strong level of school coverage. Additionally, a decentralised approach by the project has ensured engagement with schools across all four areas of Highland, meaning that the project is not 'Inverness-centric'.

#### Barrier removal and encouraging engagement

4.3 The SSA project is providing new STEM teaching resources and equipment for schools through its Newton Rooms and outreach activity, and also in providing additional online learning material during the COVID-19 pandemic. As a result, the SSA project has helped to lower barriers to engagement with STEM education, and thus increase equity of access to STEM learning. The project has engaged with around 60% of schools in Highland, many of which are in rural and remote locations, and arguably may not have otherwise engaged with STEM learning and CLPL to the extent that they have done through the SSA project. Consequently, the project can be seen as an important tool for addressing geographic inequality and inequity of STEM education access. The same is true of training and CLPL opportunities that the project has provided for STEM practitioners in Highland.

4.4 The impact of the COVID-19 pandemic on delivery brought an unintended positive consequence for the project with regard to lowering barriers to engagement. As with many other forms of learning and CLPL, lockdown and travel restrictions meant that the project shifted to online delivery. Though it was recognised by consultees that the amount of hands-on learning that could be undertaken either by young people or by teachers as part of their CLPL was restricted, remote learning offered more opportunities for schools and learners to engage with the project. The approach adopted for delivering online teaching and training is also considered innovative by consultees.

4.5 A key principle of the SSA project is providing hands-on engagement in a live STEM environment within its Newton Rooms, and through a non-traditional mode of learning. Consultees consider that this is a key strength and USP for the project. This mode of delivery is considered more engaging and attractive for learners, thus helping to stimulate interest in STEM topics.

4.6 The SSA project's engagement across year groups at primary and secondary schools is important for maintaining engagement with STEM learning. This is particularly true as learners approach the transition to the senior phase of education.

## Social capital and local relevance

4.7 An additional strength of the project highlighted by consultees is the use of social capital in delivery. This is considered fundamental to bringing STEM to life and connecting to local communities, industry and environment, and the issues that exist in them. The development of locally-specific modules and resources has also helped in this regard. For examples, the SSA project has developed modules on peatlands and space – one linked to an important natural asset for the Highlands, the other a nascent industry not just in Sutherland but more widely in other parts of the region too. This is helping teachers to contextualise classroom teaching and make it more relevant and relatable for learners.

4.8 The anchoring of delivery in a local context has also helped to create better awareness of local industry within schools, as well as promoting STEM careers in Highland. This contributes to addressing misconceptions of STEM careers, and showcasing the variety of roles and careers available within Highland – a key challenge for STEM industries and the retention of young people in the region.

## SSA project team

4.9 The project team is considered by both stakeholders and practitioners to be a real asset for the SSA project, and is highlighted as being of significant value to STEM teaching in the region. The team's approach to relationship-building and in-depth engagement is also seen as a real strength of the project. It has helped to better understand teachers' and learners' needs. Team members, both in the HIE team and in Newton Rooms, are held in high regard by supported teachers and schools, and the strong personal contact and supportive established by the team with individual schools has built a very good reputation for the project. An additional observation from consultees was that as SSA delivery staff are STEM engagement officers rather than teachers, this is beneficial for securing participation – especially for professional learning.

## Alignment with other STEM activity and teaching

4.10 The SSA project is well-aligned with other STEM activity in Highland. A number of other projects and STEM-related activity are delivering in Highland, including the UHI STEM project, and projects supported by Education Scotland's STEM Professional Learning Grants Programme. SDS also maintain a physical space in Inverness for STEM-related activity.

4.11 Stakeholders observed that there was some overlap with the UHI STEM project in terms of target audience (both projects have engaged with the majority of schools in Highland). However, the different modes of delivery are considered the differentiator between the projects, i.e. focus on in-school outreach supported by UHI's STEM Hub, versus the SSA's approach to hands-on learning in its Newton Rooms and outside the usual classroom environment.

4.12 As a result, the SSA project is considered an important part of STEM education delivery across Highland, and the HIE SSA team is considered a key strategic partner by other actors. This extends to their role in the regional STEM Partnership in helping to align STEM activity in the Highland Council area. This is important, given that there is still a complex and evolving landscape in terms of STEM activity provided by a number of different actors. This role is also expected to continue well beyond the lifespan of the City Region Deal funding, given the breadth of STEM learning, demand for STEM skills and the extent of activity required to deliver against the national STEM Education and Training Strategy.

4.13 During the review, concern was expressed by some project partners and stakeholders about potential confusion between the SSA project and other projects being delivered in the Highland area, given the overlap in terms of target audience, and between the SSA and the UHI STEM Hub. There was some anecdotal evidence to suggest that a small degree of confusion existed at the strategic level. However, stakeholder and practitioner discussions indicated that there is no confusion amongst schools and teachers, who are able to distinguish between the different STEM learning support offers. A small number of stakeholders also expressed concern about the extent to which the project was able to balance the requirements of the Newton Room franchise, and aligning with the CfE and delivering

locally-specific content. However, this concern is unfounded – the SSA team has been able to develop modules relevant to the local context, and participation from some practitioners in module development is helping to ensure alignment with teaching and curriculum requirements.

## Navigating challenges

### Delays in early project delivery

4.14 Though the project has demonstrated a number of strengths in delivery, it has not been without its challenges. For example, as set out in Chapter 3, there was a slow project start in comparison to the originally intended spend and activity profile. This was at least in part due to delays in establishing and opening the Newton Rooms. In some cases, properties were owned by third parties, so HIE was relying on project partners to facilitate spaces, which slowed delivery down at the outset. Anecdotal evidence also indicates that some properties required asbestos removal prior to renovation to become Newton Rooms. The lack of delivery space resulted in the later recruitment of staff.

### Geography as a barrier

4.15 The geography of Highland has also been a barrier, despite the success the project has demonstrated in its reach and level of coverage, particularly in remote areas. It is important to note that travel times, distance from larger urban centres and settlements where Newton Rooms are located, and the disparate nature of the school (and, indeed, general) population in Highland will always work against delivery for a project of this nature in the area. However, a key part of the Newton Room options appraisal process was to map journey times from schools to proposed locations; a maximum one hour travel time being the benchmark.

4.16 This has been countered by the provision of pop-up Newton Rooms in Skye, Lochalsh, Badenoch and Strathspey for example, alongside its physical Newton Rooms in Inverness, Dingwall, Fort William and Thurso. As a result, the value of the project has been demonstrated by the willingness of schools to travel to Newton Rooms – sometimes over long distances and journey times. This suggests that geographical challenges are treated as a ‘fact of life’ rather than an insurmountable barrier.

### Impact of COVID-19

4.17 The COVID-19 pandemic and associated lockdowns have been disruptive for the project. The project’s delivery has been significantly disrupted as a result. However, the perspective from stakeholders is that the SSA team was able to pivot delivery and still continue to deliver valuable outputs:

*“They have certainly done a power of work, particularly during the pandemic. There doesn’t seem to have been any let up in the level of activity during the pandemic.”*

4.18 Whilst the shift to online learning has brought positives through extended engagement and reach for schools that might not have otherwise been able to engage in person with the project, it also resulted in the loss of local context and social capital that brought greater relevance to project-supported learning. The loss of hands-on experiential training for teachers also meant that the ‘fear factor’ around undertaking practical STEM training to support live STEM demonstrations and teaching in a classroom environment hands-on and face-to-face experience was not properly addressed. This aspect of STEM learning is considered critical for pupils and teachers alike.

4.19 An associated challenge for the SSA project is measuring the impact and benefit for pupils of remote learning and engagement with STEM subjects through online delivery. Whilst engagement has been broadened, it is harder to measure the impact on learners in terms of their engagement and understanding of STEM subject matter through lockdown and remote learning periods.



## Monitoring progression

4.20 The delays experienced at the start of SSA project delivery, coupled with the impact of the COVID-19 pandemic on delivery means that there are difficulties in monitoring progression against targets and outcomes at this stage, as well as assessing the impact of the project overall. As one consultee noted:

*“It is difficult to answer the [project progression] question as we should have two years’ worth of delivery data...but we don’t have the data!”*

4.21 However, stakeholders and teachers consulted consistently reported that they felt that the SSA had been successful in what it had achieved to deliver to date, though there was general agreement that the longer term impact of SSA project activity on sustained engagement and participation would only become apparent after the lifetime of the project’s (current) delivery period.

4.22 There is an aim to evaluate SSA delivery more fully in early 2022 to gauge outcomes and impacts as the project approaches end of life cycle.

## Funding and strategic management challenges

4.23 Consultations undertaken as part of the review indicated that the short-term nature of the City Region deal funding is a significant uncertainty for the longer-term sustainability of delivery. Consultees highlighted the disparity between ongoing operational funding of science centres in Aberdeen, Dundee, Edinburgh and Glasgow that serve mainly urban areas, versus the lack of a science centre or STEM engagement vehicle suited to the Highlands, or indeed other parts of rural Scotland.

4.24 This lack of certainty on future delivery presents a challenge on two fronts. Firstly, it prevents longer-term planning of activity to ensure sustainability of the project’s impacts, and maximise the potential of the project’s legacy. Secondly, there is evident ongoing demand for STEM education and CLPL support. Though the SSA project is helping to address this need, demand is felt to outstrip what the project is able to supply, both in terms of outreach activity, Newton Room sessions and staff resource for delivery. In many ways this is outwith the control of the project, and the development of other offers available in Highland (e.g. Education Scotland’s Professional Learning Grants Programme, the UHI STEM project) is evidence of the acute need.

4.25 A number of stakeholder consultees noted that delivery and management of a project of this nature is not a comfortable fit for HIE’s core priorities as an enterprise agency. Whilst there was agreement that HIE had provided strong project leadership and management to deliver the SSA and its network of Newton Rooms, there was some reservation as to whether this arrangement should continue, despite a recognition of the wider, longer-term impact that the project may have on supporting key sectors in the region, or on population retention and attraction.

*“[I am] struggling to see a real rationale for the project within HIE, and what HIE is being asked to do by Scottish Government... it doesn’t directly help HIE achieve innovation or productivity objectives. Though it does help make region attractive, sticky for its population, its young people.”*

4.26 Further, some consultees highlighted that there was frustration amongst some in the wider Highlands and Islands region that the project is delivering in Highland only. There was recognition that the project is funded through the Inverness and Highland City Region Deal; however, it was noted that similar offers were being developed elsewhere in the region, e.g. through the Argyll and Bute Rural Growth Deal and the Islands Deal, and these initiatives could be better co-ordinated. This perspective appears to stem from HIE’s role as lead delivery organisation for the SSA project.



## Impacts to date

4.27 The delays at the start of the SSA project delivery, and the interruption as a result of the COVID-19 pandemic, mean that gauging the impact and effectiveness of SSA project delivery is difficult. Many stakeholders felt that it was too early to make a judgement on how successful the project has been to date against stated objectives. However, though the interim review has not been able to engage with teachers and STEM practitioners as originally intended, consultations with stakeholders and practitioners have identified some impacts and benefits that the SSA project is already helping to realise. These are set out below

### Teachers/schools

4.28 The SSA is valued by teachers, and seen as an important resource to support STEM teaching in schools, and raising awareness of the importance of STEM education. It is helping to drive a greater degree of engagement and activity in STEM learning.

*“My impression is that teachers are really welcoming this [the SSA project] – and during COVID, it has become a critical part of teachers’ and schools’ offering too. Given the contemporary importance of science and technology it has been really beneficial.”*

4.29 The focus on primary and secondary schools from Primary 6 through to S2 is also considered particularly beneficial. It was noted that it helps to maintain engagement of learners through a key period as they move towards the transition into senior phase. It also offers the possibility of early introduction to STEM concepts and subject matter that will be revisited in future years, helping to firmly embed knowledge:

*“Our STEM module [delivered through SSA] Picked up on subject matter that would be dealt with in 1<sup>st</sup> and 2<sup>nd</sup> senior year – so pupils can go back to their experience through SSA and better contextualise their learning.”*

4.30 Through the modules and CLPL events delivered to 672 practitioners in total, the SSA project has contributed positively to developing the capacity and capability of STEM teachers and practitioners in Highland schools. Stakeholders and senior practitioners reported that teachers have been inspired by the SSA, and are now more confident to engage in STEM teaching, and support a wider range of STEM activity within schools – inside the classroom, as well as outside, for example through “loose parts play” to support engineering investigation and learning. This confidence extends to following lines of enquiry led by pupils themselves, on topics set by teachers:

*“We are now doing lots of child-led stuff, with the class teachers being more responsive to investigations... the big questions are coming from the kids, and staff are more confident in setting those big question themes and then following lines of enquiry that are kids-led.”*

4.31 It is worth emphasising the point here that delivery of the CLPL sessions were in part driven by the COVID-19 pandemic. As delivery has picked back up following the easing of restrictions, project delivery has moved away from CLPL. However, feedback from practitioners indicates that the CLPL sessions have been really well received, and a valued part of SSA delivery.

4.32 Improved confidence to employ new equipment and explore the potential for using additional resources following SSA engagement was also reported. Given that research undertaken at the national level identifies teacher confidence and capability as particular challenges, this is a positive finding.

*“Our school has bought some additional outdoor maths equipment following the SSA sessions.”*

4.33 However, this impact is not seen everywhere. One practitioner reported that they had observed only limited increase in teachers' understanding and capability so far, though they could see the benefit for younger teachers in particular. However, they stressed that further engagement by teachers in the SSA project would likely change this and result in more positive impacts in future.

4.34 Stakeholders also reported that the SSA project is making a considerable contribution to supporting schools and teachers to build peer networks for knowledge exchange and support through learning. This is happening as a result of connections made through the SSA team, as well as through peer-to-peer connections across associated school groups, and more widely.

4.35 The SSA project is also helping to increase awareness of the availability of other STEM learning and CLPL resources. One consultee noted that they were aware of teachers choosing to pursue support through Education Scotland's STEM Professional Learning Grants Programme as a result of engaging with the SSA.

4.36 Additionally, though not a core aim of the project, it has also helped to increase teacher awareness of a number of equity and equality issues in relation to STEM education. For example, evidence indicates that teachers are more aware of the need to ensure equity and equality in engagement, participation and achievement in STEM across different under-represented and disadvantaged groups. Teachers have also gained increased confidence in tackling gender stereotypes and unconscious bias in STEM education.

## Learners

4.37 At the time of writing, the SSA has engaged around 7,300 pupils. This is a significant reach in terms of pupil engagement, and can be built upon through the remainder of the project's delivery. Though the evaluation did not directly engage with learners that have benefitted from the SSA project, either through visits to Newton Rooms or learning via outreach modules, evidence gathered from consulted stakeholders and practitioners indicates that there is increased engagement levels in STEM learning and STEM subjects amongst pupils.

*"It is really beneficial and engaging, the pupils are really enthusiastic – particularly given the circumstances, social distancing, and weather [for outdoor learning]!"*

4.38 There is also a positive change in learners' motivation in STEM learning reported by consultees. As a result, it is considered that learners' awareness of STEM subjects and their relevance has increased

4.39 These initial findings indicate a positive experience for learners, and is a promising indication for increased engagement with STEM education in future. However, given the lack of primary research directly with learners during this interim review, more research will be required to determine the extent to which learners are engaged with STEM subjects and learning as a result of the SSA project, and how far this engagement persists over time.

## Wider benefits

4.40 The overall consensus from consultees is that the SSA project is augmenting the delivery of STEM education and training in Highland. Even with the project's relatively limited staff and project resource, and in working across the challenging geography of the Highland area, the project has provided valuable support activity and outreach for the delivery of STEM lessons in schools, and to support the CLPL of STEM teachers and practitioners.

4.41 There is some evidence of the emergence of cross-curriculum linkages, and connections with other topics, e.g. green recovery, local environments and the climate emergency. For example one school is working to better connect their curriculum to the local environment through STEM learning:

*“We are looking at our curriculum just now...we want to build in community resilience, flood mitigation, and response. There is a burn nearby the school, which is often in spate, this raises the water table. We’ve not flooded, but are considering school actions to prepare and mitigate against flooding – so we are modelling things in sand trays [with the pupils].”*

4.42 Evidence from stakeholder consultations and engagement with practitioners indicates that school and teacher participation in the SSA project is helping to encourage a cultural shift regarding STEM teaching. This is invaluable in terms of integrating STEM into all aspects of the curriculum within schools, developing cross-curriculum linkages, and making connections between STEM and other learning topics. This is encouraging with regard to increasing exposure to and engagement with STEM amongst learners in Highland. It also suggests that there is already a degree of sustainability of impacts, with project participation leading to longer-term changes in STEM education in school settings.

4.43 The SSA engagement, some schools are also introducing STEM skills with local industries in mind (e.g. fisheries and aquaculture, land management). This is helping to better demonstrate the range of STEM employment and career opportunities in the region, thus contributing to an earlier awareness of local STEM career opportunities amongst learners.

4.44 Finally, the SSA project is developing an extensive portfolio of online and physical STEM education and training resources. This is a strong asset not only for the project, but for ongoing delivery of STEM learning activity across Highland – not just for delivery to schools in the area, but potentially for other groups as well going forward, e.g. community learning and development. The digital resources developed in response to the COVID-19 pandemic are also expected to serve as a lasting resource that schools and teachers can draw on beyond the lifetime of the project.

## **Perspectives on progress and future project delivery**

4.45 The SSA project is viewed positively by stakeholders and beneficiary practitioners. Evidence indicates that delivery is on the right track overall, with wide engagement across Highland schools. Consultees are of the view that the SSA project is playing an important role in raising the profile of STEM education, and helping to facilitate a more coherent STEM offer for schools. There is also a perception that many more rural, remote schools would not necessarily have engaged with STEM learning without the availability of the project.

4.46 There is also a sense from stakeholders that without the SSA project, STEM delivery in Highland would be much lower profile and piecemeal. This would have resulted in lower awareness of and engagement with STEM education opportunities, and in turn there would have been lower awareness of STEM employment opportunities in Highland. For some stakeholders, the SSA project has also helped to secure additional traction for other projects and activity, contributing to creating a critical mass for STEM education activity.

4.47 Stakeholders consider that there remains a strong rationale for the project as it continues delivery over the next 18 months or so. For some, the project has taken on greater significance and importance in a post-pandemic education landscape, and that there is a real urgency to achieve the project’s objectives. Nevertheless, in continuing the project’s delivery to December 2022, there are some key areas of focus and adjustment that the SSA project can address whilst continuing to adhere to its core objectives.

4.48 Though the SSA project places emphasis on learning in a non-classroom environment, a (greater) emphasis on ‘training the trainer’ through CLPL activity will generate benefits in terms of teacher confidence, capability and enthusiasm. This can help to embed and sustain engagement with STEM learning beyond participation in Newton Room project activity, particularly when delivered with additional focus on pedagogy.

4.49 The age range that the SSA engages with (P6 through to S2) is important in helping to address an apparent disconnect between primary and secondary STEM education. This begins to target the need for STEM content that drives continued engagement during the transition to senior phase for pupils, and there should be consideration of how the SSA might be able to engage with those in S3 and even S4, to better address issues of STEM engagement through transition.

4.50 There is a perception that a blended learning approach is best. Highland's rurality means that technology is key for underpinning content, supporting face-to-face activity and outreach and widening access - especially for CLPL. Taking such an approach will ultimately provide more opportunities for engagement of schools in rural and remote areas, and help to maximise the benefit and interest that can be gained from practical exercises and experiments.

4.51 There needs to be greater combination of STEM with inter-disciplinary learning and cross-cutting skills development. This aligns well with work by SDS and partners on cross-cutting and meta skills development, and increasing emphasis placed by employers across a number of sectors on transferable skills. It is also well aligned with current UHI research on inter-disciplinary learning across the skills pipeline. Further, it also lends itself well to teaching of social and environmental issues such as the climate emergency, which cuts across a number of topics.

4.52 Having the project staffed by STEM engagement officers (rather than teachers) is considered a strength of the project, but there is scope for the SSA project to explore the ways in which it collaborates with partners to enhance the teaching (and training) experience. There is scope to involve Highland Council Officers and teachers responsible for STEM to a greater degree, and take a co-delivery approach with teachers in Newton Rooms – and indeed through outreach activity at schools. A co-delivery approach still has merit, as this helps to overcome issues of confidence and can help to make initial STEM lessons more engaging, especially in primary settings.

4.53 There is some evidence to suggest that combining Newton Room visits with increased levels of pre- and post-visit engagement can contribute to greater persistence of learning and sustainability of impacts. It is understood that the Glasgow Science Centre has begun to implement an approach that sees a period of engagement with schools over a number of weeks prior to visits to help embed learning. This includes CLPL, underlining the importance of teacher training. However, this approach in the Highlands of deeper engagement at the individual school level could be at the expense of less engagement/coverage of schools overall.

4.54 Given the range of other STEM-related activity being delivered in Highland, there is potential for the SSA to develop its model, learning from other projects to enhance its activity, and integrating any legacy material to maximise the benefit for the region. This can help to widen the offer to engage a broader range of pupils, teachers and audiences, so that the whole school STEM journey from early years through to secondary (and possibly beyond) may be addressed.

4.55 Such a development would certainly help the SSA project to respond to need in a post-COVID environment. To ensure the project's responsiveness to need, there should be a degree of horizon-scanning undertaken. Along with broadening the offer, this will also help to position the project as it reaches the end of its CRD funding, and explores options for future delivery. Further consideration is given to this from a strategic viewpoint in Chapter 5.

## 5 Positioning for the future

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### Introduction

5.1 The SSA project has some 15-18 months remaining to deliver activity as part of the Inverness and Highland City-Region Deal. However, within the scope of this interim review was the requirement to consider the factors which will influence the future focus and direction of the SSA as the City Region Deal funding period comes to an end. This chapter discusses this and is based on a number of consultations conducted with key stakeholders and partners.

### The post-City Region Deal context

5.2 As the country emerges from the COVID19 pandemic and the economy begins to recover there is already and will continue to be a period of extremely tight public sector finance ahead. This will have implications for future programmes and initiatives. In addition to the need for alignment to current and emerging national and regional policy, consideration must be given to the design of new, leaner and more streamlined project delivery models to maximise value for money for public sector funders and to make investment propositions for the private sector more attractive.

5.3 With this in mind however, the SSA is currently in a position to be able to present a strong case to potential funders with respect to both its alignment with current education and STEM policy, and the rationale for the delivery model and the portfolio of STEM related learning and training activities which have been developed to date.

5.4 However, there is a need to be aware of the coming review of the STEM Strategy later this year and the organisational reviews of both Education Scotland and the Scottish Qualifications Authority, due to report in early 2022. Their findings may have implications for the future direction of travel of the STEM strategy for the Highlands and wider region which will, in turn, influence the provision of STEM learning as well as the shape of delivery models and activities in the future.

5.5 At a policy level the SSA, as described earlier in Chapter 2, aligns well with the Scottish STEM Strategy in a number of ways. It promotes equity and equality of access to STEM learning opportunities for those learners and practitioners in the more rural and remote areas of Highland region via its network of STEM learning hubs. As discussed earlier small schools with composite classes, low population density, and large travel distances to science centres in Scotland's cities has influenced the SSA delivery model. Considering how to better engage under-represented groups and enable access to STEM education and employment has also been a key objective of the project as has ensuring the SSA's alignment with other STEM activity being delivered by partner organisations across Highland.

5.6 The approach to STEM education adopted by the project, i.e. taking a local, social capital approach to content development, (similar to science centres), also reflects what is considered good practice in STEM teaching.

5.7 The project has attracted significant capital investment. Continuing to make the best use of these assets in the form of the Newton Rooms (including the mobile facility) to enhance collaborative activity and expanding their usage by visiting organisations thus extending the project's reach gives the SSA a strong case for future funding and delivery.

5.8 The SSA delivery model has been developed to serve a range of audiences. Its blended model of delivery can be flexed to include a combination of fixed sites and mobile delivery in combination with online learning to maximise the project's reach across rural and remote areas.

5.9 All of the above helps to firmly position the project in the STEM landscape as it reaches the end of its current funding, and begins to explore options for future delivery.



## Future delivery model

5.10 As mentioned above, new and emerging STEM policy will have an important bearing on the future focus and direction of STEM learning and teaching in Scotland. However, future funding for the SSA or its successor will be dependent on a number of other factors.

5.11 Firstly, the SSA must ensure strategic and operational alignment to other STEM activity, both regionally and nationally. It will be important for the SSA as a STEM organisation to have the ability to address gaps and widen access to STEM learning including consideration of widening its coverage to the rest of the Highlands and Islands not currently served by the project.

5.12 Given the range of other STEM-related activity being delivered in Highland by other organisations, and SSA's collaborative ethos and partnership network there is potential for the SSA to further develop its current model, learning from other projects to enhance its activity, and integrate any legacy material (including from other STEM teaching organisations or programmes) to maximise benefit for the region. Such development would also help the SSA to respond to emerging needs in a post-COVID environment.

5.13 In anticipation of changes to the STEM landscape it will also be important to expand existing partnership networks and collaborative activity undertaken to date and identify new ones.

5.14 A future delivery model must be fit for purpose. This involves developing content that is aligned to the government's Curriculum for Excellence education programme with more modules being aligned with industry sectors and careers prevalent in the Highlands and Islands. In addition, the SSA by capitalising on locally-specific STEM modules already developed could support a shift away from the First Scandinavia/Newton room franchise if required by future potential partners and funders.

5.15 The delivery model of the future must also, importantly, focus on practitioner CLPL and making activity more longitudinal in nature to ensure the sustainability of STEM learning delivered in both the Newton Rooms and afterwards in the classroom. The use of technology as a result of the COVID19 pandemic has become a key enabler in the delivery mix for both learners and practitioners as it helps to widen and increase access for both audiences across the region.

5.16 The cost of provision will be an important factor in future delivery. As alluded to already the continued use of existing 'capital' assets (Newton Rooms and equipment) by the SSA and other partner organisations and local community groups will present a better value for money picture in future funding considerations. A continued shift away from what can be perceived by some as a costly franchise to solely in-house development of STEM learning content will also have an important bearing on project cost.

5.17 Planning for the future should entail a review and consideration of the SSA's existing profile. There is a widely held view that whilst it does have a profile in the STEM landscape, more so regionally, it is not operating at a national level on an equal footing, for example, with the Scottish science centres, Education Scotland or SSERC. Its profile will no doubt influence HIE's ability to access future funding and potentially raise private sector sponsorship or financing.

5.18 Alongside a review of its profile is a need to assess the project's branding as the SSA or Newton Rooms network. There is uncertainty which has more leverage in the current STEM delivery landscape. In undertaking a branding review exercise for continuation of the project, and importantly its ability to attract more funding, it may be useful to approach teachers and other partners for feedback.

5.19 In the meantime, building momentum and profile over the remaining project period will be important.

## Transition from a City Region Deal project

5.20 As the SSA's City Region Deal funding comes to an end, HIE, as the SSA's current project Lead and sponsor, has a number of options worth exploring with respect to the project's future funding and management.

5.21 The SSA could remain within HIE's portfolio of programmes. It could be funded wholly or in part from HIE's core budget. However, as discussed earlier in this report there is a strong view that the SSA lacks a strong fit with HIE's core priorities as an enterprise agency. The learning pathway from STEM skills in school to enterprise activity is a long one therefore an education provider could be considered a better 'home' for a project such as the SSA.

5.22 UHI is a unique partnership of 13 colleges and research institutions across the Highlands and Islands. It is heavily involved in delivering STEM related learning to schools across the entire region and is the Lead partner of the Regional STEM Partnership in the Highlands and Islands. Through the SSE Renewables Highland Sustainable Development Fund its UHI STEM project- due to conclude later in 2021- has engaged with and delivered a wide range of STEM learning and CLPL activity to schools and teachers which has been complementary to that of the SSA. Experienced in both outreach programme delivery and managing and delivering activity in its STEM Hub in Inverness, UHI may have the appetite to continue this work through an SSA delivery vehicle. In addition, it has access to various funding sources nationally which could be accessed to continue the SSA's activities across the wider region.

5.23 Highland Council is also a key partner in the delivery of STEM learning through its mainstream school education. Given the SSA's target audiences are school pupils and practitioners, there is a natural fit between the SSA and the Council's education department. The Council is an obvious management and delivery partner however, a lack of local authority finance is likely to be a barrier to such a solution. However, new funding sources could potentially be considered by the Council, for example, the UK Government's Shared Prosperity Fund (a replacement for European investment funds) details of which are anticipated at the Autumn Spending Review and Budget later this month.

5.24 High Life Highland (HLH) is a charity registered in Scotland by The Highland Council. HLH develops and promotes opportunities in culture, learning, sport, leisure, health and wellbeing throughout the whole of the Highlands. HLH has a network of leisure centres, community centres and community schools across Highland and has a Youth workstream which provides training opportunities for young people. There is an appetite by the organisation to be involved in the types of activity currently delivered by the SSA and with the SSA team; it also has the potential to be able to expand the network of Newton Rooms and/or STEM Hubs thus reaching a wider, school and non-school audience. However, it would require a funding partner if the Council was unable to support the SSA directly. Delivery activity, however, would potentially exclude the Islands and other areas. However, given that similar STEM offers are currently being developed in some of those areas, through the Moray Growth Deal, Argyll and Bute Rural Growth Deal and the Islands Deal, there could be a co-ordinated programme of STEM hubs and accompanying activities to provide access across the whole of the region.

5.25 If a final evaluation of the SSA concludes that there is a continuing rationale for the SSA in the region and that it has delivered benefits and impacts in line with the aspirations of the STEM Strategy, then a case could be made for funding directly from the Scottish Government. In the absence of a science centre which serves the Highlands and Islands a funding package for the SSA comparable to that of the existing four science centres in Aberdeen, Glasgow, Edinburgh and Dundee could be perceived as being reasonable. The SSA is currently a STEM engagement vehicle and delivery model designed to overcome the specific challenges faced by learners, schools and practitioners in the Highlands and other parts of rural Scotland.

5.26 Another option to be considered is that of commercial sponsorship or funding from the private sector. There are examples of Newton Rooms and other similar STEM learning models around the world

which are delivered in partnership with commercially focussed sponsors and in many cases their strategic focus is directed to a certain extent by their private sector funders.

5.27 For example, the Boeing Company has been a strategic partner of FIRST Scandinavia on the Newton Room concept since 2013 and has invested \$5M USD to bring the Newton Room concept across Europe. The investment has funded several types of Newton Room to deliver high-quality experiential STEM education to primary and secondary school students in Europe consisting of the following:

- Boeing Newton Flight Academy: A permanent classroom used to teach students aviation-related STEM concepts, reinforced with full-motion flight simulators.
- Boeing Newton Rooms: A themed, state-of-the-art permanent classroom focused on experiential learning. Potential themes include space, biofuels and advanced materials and manufacturing.
- Boeing Pop-Up Newton Rooms: A portable package of flight simulator panels and classroom materials used to create a temporary Newton Room in virtually any suitable existing space.

5.28 To date, Boeing has supported the establishment of one of each of the above facilities in countries such as Denmark, Norway and the Netherlands. Boeing's investment has also funded a comprehensive suite of learning resources and materials, enabling teachers to incorporate the Newton experience into their core educational curriculum. All materials are free for both teachers and students.

*'Newton's proven teaching methods and immersive, hands-on educational environments will help excite future innovators to pursue careers in STEM fields—many of which can be found at Boeing'*

5.29 Other examples include Statoil of Norway which sponsors the FIRST LEGO League, Teach First Norway, and many of Norway's science centres as part of the Heroes of Tomorrow programme and the national STEM strategy. Statoil sponsor the Newton room at the Norwegian Oil Museum in Stavanger and through an agreement with Nordland County sponsor several Statoil ENGIA Newton rooms across the Nordland area. Statoil also provides support to universities, including study places in PhD programmes. Their overall goal is to inspire young people to learn and discover STEM subjects.

5.30 It is fair to say that the majority of commercial sponsorship for STEM activities is sourced from organisations that are pursuing interests in line with government policies for example, for example, driving their business models towards net zero targets, or through sponsorship and funding, companies are investing in their own future, through supporting the creation of a pipeline of knowledgeable, skilled workers for their industry sector.

5.31 There may be an opportunity for HIE (as the SSA project lead) to pursue commercial sponsorship by engaging with science and/or technology based companies in the region, for example Dounreay Site Restoration Limited, Global Energy, and Boeing UK already part of the Boeing Scotland Alliance. However, there will be a need to be able to demonstrate that a partnership of this kind can deliver a range of tangible benefits for a commercial partner.

## Planning for post-City Region Deal Funding

5.32 It is important that the SSA team and relevant HIE SRO begin the planning process for the SSA's successor or follow-on project before the current funding period comes to an end; indeed, this may have already commenced.

5.33 There are a number of activities which should be undertaken with a view to developing the business case to secure the level of funding which could be required going forward.



5.34 Consultation and engagement with key partners and stakeholders should commence on the back of this interim review with the aim of better understanding their priorities and plans for future delivery activity. At the same time, undertaking a mapping exercise of all existing and potential new STEM related initiatives will provide important information which will ensure a future project can adopt a strategic focus and ensure joined up working and co-ordination across the region.

5.35 A final evaluation of the impacts and wider benefits delivered by the SSA will also be required to inform the design of future delivery and the business case for future funding whilst taking into account any change of direction within the STEM strategy landscape.

5.36 A consideration of the geographic coverage for any future activity must be considered hand in hand with other partners' planned or emerging activities and the priorities and focus of potential funders.

## 6 Conclusions and recommendations

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### Introduction

6.1 This chapter sets out the conclusions of the interim review of the SSA. It also presents some initial recommendations for the project of relevance for the remainder of delivery. It also sets out a series of considerations for the project beyond the lifespan of its City Region Deal funding.

### Key findings and conclusions

6.2 The SSA project's delivery to date can be considered successful. Even factoring in the significant disruption that has been experienced as a result of the COVID-19 pandemic, the project has managed to achieve some strong outputs, and is well-placed to work towards realising its targets by the end of delivery. The project has achieved wide engagement across Highland schools, and it is viewed positively by stakeholders and beneficiary practitioners.

6.3 At a strategic level, the SSA project is augmenting the delivery of STEM education and training in Highland. Its model complements that of other projects, and the combination of Newton Room delivery with outreach activity brings benefits to practitioners and learners. SSA delivery has helped to drive a positive change in learners' motivation in and engagement with STEM learning. The project is valued by teachers, and is seen as an important resource to support STEM teaching in schools. It is also a key tool for raising awareness of the importance of STEM education.

6.4 In working across the challenging geography of the Highland area, the project has provided valuable support activity for the delivery of STEM lessons in schools, and to support the CLPL of STEM teachers and practitioners. Though CLPL was not originally a key part of project delivery, this aspect of the project has realised a number of benefits for teachers and practitioners of STEM. As such, the SSA project has contributed positively to developing the capacity and capability of STEM teachers and practitioners in Highland schools.

6.5 Delivery has not been without its challenges. The project experienced some delays in the early part of operational delivery, and the onset of the COVID-19 pandemic prompted revision of delivery and approach during periods of national lockdown in order to ensure ongoing engagement of pupils and practitioners. The particular geography of Highland has also presented logistical challenges, as might be expected in a project of this nature. Nevertheless, the SSA project is on track to achieve its outcome target of 9,500 pupil engagements by project end.

### Recommendations for ongoing project delivery

6.6 Based on the conclusions presented above, the following recommendations are made for the remainder of the SSA project's delivery.

#### ***Recommendation 1: Take opportunities to maximise project delivery***

The project has a maximum of around 17 months left to deliver against its intended objectives. The delivery team, HIE and partners must take every opportunity to ensure the engagement potential of the project is realised. The SSA project has experienced considerable disruption due to COVID-19 as well as slow delivery in the early stages, and because of delays, there is still a need for the project to capitalise on its promising achievements to date.

***Recommendation 2: Exploit opportunities to embed learning and extend project reach through technology***

The SSA's online outreach during the pandemic has shown the value of a blended learning approach, and this has also been demonstrated through other project delivery. Underpinning face-to-face learning in Newton Rooms and in classroom-based learning with engagement through digital channels can serve to reinforce learning for pupils and teachers.

***Recommendation 3: Train the trainer***

Though CLPL was not originally a key delivery objective of the SSA, the project's move to train and upskill teachers and practitioners, prompted by the pandemic lockdown and related restrictions, has been a valuable part of delivery. Teachers are important influencers in terms of STEM engagement, especially at primary level, and this should not be forgotten. Supporting teachers in their STEM practice is also critical for ensuring the sustainability of STEM learning as part of the SSA.

***Recommendation 4: Exploit opportunities for co-delivery***

Aligned to Recommendation 3, the SSA project should explore the potential to engage school teachers more with the project's delivery, which will contribute to building capacity and capability within schools. This can be done through co-delivery in Newton Rooms, or in a classroom (or outdoor learning) setting. In-class observation and supporting online engagement also offer further opportunities to develop teacher and practitioner skills.

***Recommendation 5: Continue to maximise interdisciplinary learning through module content***

There is an increasing focus on interdisciplinary learning and development of cross-cutting skills. Future modules developed by the SSA project need to continue the exploration of issues that span a range of areas, avoid being focused on a single sector or discipline. In particular, modules that can enhance the development of cross-cutting skills to strengthen STEM understanding would be beneficial.

***Recommendation 6: Seek opportunities for wrap-around engagement***

Subject to the availability of project resources, the SSA project should examine the possibility of implementing pre-engagement and 'aftercare' activity around face-to-face engagement. This can serve to reinforce learning and builds sustainability of impacts.

***Recommendation 7: Increase collaboration for delivery***

Wherever possible, the SSA project should take opportunities to extend the reach of its activity and engagement through collaboration. There is potential to exploit existing strategic and operational relationships with RAiSE, SSERC (and its work around the STEM Ambassador Hub), Education Scotland and UHI. This should include signposting to, or (where relevant) integration of, material developed by non-SSA activity. For example, the UHI STEM project is currently focusing on developing its legacy as it reaches the end of project delivery, and there is no follow-on funding currently in place. Integration of its legacy resources with the SSA project can help to expand the SSA's own portfolio, offer and this reach - an important consideration for longer-term funding considerations.

***Recommendation 8: Maximise the impact of the SSA's resources***

In a comparatively short time period, the SSA has built up a strong portfolio of physical resources, online assets and learning material. The potential of these resources should be maximised to support outreach and learning engagement, as well as income generation (e.g. space hire within Newton Rooms).

**Key considerations for the SSA post-City Region Deal funding**

6.7 Following on from the recommendations for ongoing project delivery, there are a number of considerations for HIE regarding the continuation of project delivery – or indeed successor STEM engagement activity that builds on the SSA project's legacy.

### ***Consideration 1: Developing the business case for future funding***

HIE and partners are cognisant of the remaining timescales for the SSA's project delivery. Bearing this in mind, work should commence on developing the case for future funding, either for continuation of the SSA project, or for the development of successor or follow-on activity. This should incorporate, but not be limited to, the following actions:

- a) Consultation and engagement with partners should commence following the interim review, taking due cognisance of its findings and recommendations. This should serve the purpose of identifying future priorities for project delivery, and the best way to deploy project assets in future.
- b) HIE and partners should undertake an exercise to map all STEM-related projects and activity being undertaken, in development and being planned across the Highlands and Islands. This mapping exercise should adopt a strategic focus, with a view to identifying opportunities for joined-up working and co-ordination across the region. As well as similar projects being proposed through other growth deals across the region, other funded project activity (e.g. that being delivered through Education Scotland's STEM Grants Programme) is also taking place, and this mapping exercise will help to identify ways in which the SSA project can benefit it, and vice versa.
- c) Whilst this interim review sets out a number of achievements and impacts to date, HIE should seek to build a detailed evidence base of impacts through a full evaluation of the project, which is anticipated to be undertaken in 2022. This will help to identify which modes of engagement have proved most successful, particularly since the COVID-19 pandemic, and will also help to refine future priorities for project delivery.

### ***Consideration 2: Positioning the SSA as a science centre for the North***

This review has highlighted the role that the SSA plays in meeting a need for STEM learning and practitioner support that was not previously met. It also identifies the way in which the existing science centre model in Scotland's cities does not fit Highland, and thus rural Scotland. Conversely, the SSA is addressing these needs through its Newton Room approach.

With this in mind, HIE and partners should give consideration to positioning the SSA as a science centre for the North. Providing the STEM resources and support required in rural and remote areas requires a model tailored to the particular characteristics of the area, rather than applying an approach designed with urban areas in mind.

This rationale, in conjunction with the evidence identified by this interim report and that which will be gathered in line with the actions under Consideration 1, can form the basis for discussions with the Scottish Government.

### ***Consideration 3: Widening geographic coverage of the SSA***

As noted in the report, there is some frustration within the region that SSA delivery is confined to the Highland Council area (acknowledging that the project is funded through the Inverness and Highland City Region Deal). In line with the mapping action under Consideration 1, there is scope to align and potentially integrate SSA activity with other projects either in development or planned in Argyll & Bute, Moray and the Western Isles. This would give the SSA project credibility at both the regional and national level. It can also help to increase the project's critical mass with regard to future funding options. However, tangible benefits would need to be demonstrated to secure sufficient funding to support a project of this scale – particularly in the case of attracting private funding to support activity, e.g. as part of one (or more) company's Corporate Social Responsibility (CSR) or Environmental, Social, Governance (ESG) activity.

***Consideration 4: Developing a delivery model for a potentially different STEM landscape***

Given the forthcoming review of the STEM Education and Training Strategy, the OECD review of the Curriculum for Excellence, and the development of the new Economic Transformation Strategy for Scotland (and its associated sub-strategies) the SSA delivery model may need to be adjusted to fit this new landscape. Involving practitioners in the development of a new delivery model and approach and perhaps STEM delivery activity itself (co-delivery in Newton Rooms/STEM Hubs supporting teachers to improve their practice) should be considered. This alignment with STEM activity in schools and teacher CLPL would further address the need to ensure the sustainability of STEM learning.

## Appendix 1: Consultee organisations

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Auchtertyre Primary

Bridgend Primary School

Education Scotland

Glasgow Science Centre

High Life Highland

Highland Council

Highlands and Islands Enterprise

North Highland College

Scottish Funding Council

Scottish Government

Tain Royal Academy

University of the Highlands and Islands