Abstract:

For over 50 years, including some form of Space education in school curriculum has become an established approach for inspiring young minds to study the sciences and pursue science-based careers. Space camps and schools are active all around the globe and typically attract the 'best and the brightest' young minds. But the context of Space is broad and all young minds need the confidence and ability to make choices that will best serve them in the world of learning, life and work.

Designing Transformations: Can the context of 'Space' serve as an inclusive educational engagement model and career skills tool to achieve "Schools of Excellence"(SoE)? This paper presents a case study for democratizing space education within Scotland; through a new Schools of Excellence Model, and using design methodology to convey an educational experience. It further demonstrates how the SoE model proposes the context of Space to dovetail with Scotland's Curriculum for Excellence (CfE)*****, with particular relevance to skills for learning, life and work to build skills and foster career agility to equip individuals for the new and changing demands of the future workplace.

***** Curriculum for Excellence (CfE) is Scotland's new approach to the curriculum, with emphasis on outcomes rather than inputs.

I. Introduction

I.I Background

Scotland has a history of innovation and Space exploration with the likes of Arthur C Clark, a member of the Paisley Rocketeers (regarded as the world's first amateur rocketry group) and Brian Binnie, who in 2004 pioneered the first privately-manned craft to reach space, to name but a few. Space education has been part of space programmes since satellites first went into earth orbit in the late 1950's with Space as an established approach for inspiring young minds in school curriculums, particularly the latter stages.

Over the next decade, the most vibrant educational innovations will take place outside traditional learning institutions. How can we create ways of working together to enrich the learning community? How can we create new ways of getting young people hooked into learning at all stages of their journey? The Designing Transformations Project proposes answers to these questions and then takes the first step to proposing a new Schools of Excellence (SoE)[1] model and evaluating a pilot programme.

Design thinking can be applied across the spectrum of innovation. The starting position is the premise that applied creativity offers new ways of working together to broaden learning communities and new modes of educational engagement. This premise is well substantiated by the examples of design-informed public services through collaboration as outlined by leaders in the field: Design Council [1,2] and IDEO [3]. John Thackara [4], a noted expert in design thinking and co-creation, has written of how co-design methodologies have created opportunities leading to innovation and change to public services, '*… telling people what to do seldom works. A more promising approach is to start with existing grassroots activity and then to create frameworks that enable these actions to develop.*[2]" This approach is highly evident in Stanford University's K12 project [5], which laid the framework for design thinking as a valuable and appropriate approach for exploring and reconsidering ways to learn and ways to

[1] Schools of Excellence (SoE), Skills Development Scotland (SDS), Curriculum of Excellence (CfE), Building the Curriculum 4 (BTC4), Science Technology Engineering and Mathematics (STEM), Higher Education (HE), Further Education (FE), Scottish Space School (SSS),

[2] Doors of Perception web log, (doorsofperception.com) which originated in 2001 is a central forum for international public service and grassroots projects.

enhance learning.

The driving force behind Designing Transformations was Skills Development Scotland (SDS), a new Scottish Agency that represents a merging of Careers Scotland, LearnDirect Scotland and sections of Scottish Enterprise. SDS invited partners Robert Gordon University/Gray's School of Art to review the existing SoE model which used inspirational/iconic partners as a hook for young people to consider careers in Science, Technology, Engineering and Mathematics (STEM) they might not otherwise have considered. Fundamental to the development of a new model were the goals to seek fresh thinking around the existing model, to increase the capacity for partnership working and to make industry and iconic partners much more accessible to the needs of a wider and perhaps younger body of students.

Space education has been part of space programmes since satellites first went into earth orbit in the late 1950's. In the Education and Skills Case for Space, Spencer and Hulbert [6] noted that space exploration has a direct, positive effect on educational and career decisions and on participation and achievement in physical sciences in the secondary years and in Higher Education (HE). In the instance of Designing Transformations, the starting point for the new SoE model was a reconsideration of the existing Scottish Space School (SSS), a programme in operation for over 10 years, highly regarded for its involvement of iconic partners (primarily NASA) and serving as an early example of a School of Excellence [7]. Open to all Secondary 4 - 5 (Ages 15-17) pupils in Scotland, the SSS provides STEM related inspiration and motivation as pupils progress through the latter years of schooling and into further education. A recent evaluation of the programme concluded that the focus of the activities is at a stage when pupils have made their career choices and many are already focussed on STEM subjects and careers [8]. It was recommended that the selection of young people to engage requires transformation, and that Primary 7 – Secondary 3 (ages 11-14) is the optimum target group, which is the age prior to when subject choices are made. Therefore intervention in the curriculum should be at a younger age, not when pupils have already chosen their career path with an opportunity to develop creative ways to engage these pupils.

While many innovative learning and careers projects are ultimately driven and reliant on the vision, the application of design thinking methodology to a service such as education benefits most from critical evaluation of opportunities for new career routes, new partnerships, and new modes of engagement. Central to this process is the need to integrate the model with Scotland's new Curriculum for Excellence (CfE) specifically, Building the Curriculum 4 (BTC4): Skills for learning, skills for life and skills for work [9].

I.II Curriculum for Excellence (CfE):

Introduced in 2009, this is Scotland's new curriculum, which aims to achieve transformation in education in Scotland by providing a coherent, more flexible and enriched curriculum from ages 3 to 18[3]. Building the Curriculum 4 (BTC4) asserts that skills should be developed across all curriculum areas, thus supporting interdisciplinary studies and in all the contexts and settings where young people are learning. It provides flexibility in how learning opportunities are delivered: '*opportunities to develop skills may be offered in different ways appropriate to learners' needs, whether through active learning, interdisciplinary tasks or the experience of learning in practical context*' [9].

I.III Research Objectives

1. To propose, capture and codify the design process used during the development of a new model for Schools of Excellence.

[3] The curriculum includes the totality of experiences planned for children and young people through their education. The purpose of the Curriculum is encapsulated in the four capacities: to enable each child or young person to be a successful learner, a confident individual, a responsible citizen and an effective contributor.

2. To explore the societal, cultural and environmental contexts of Space as it relates to the world of learning, life, and work.
3. To design new approaches to widening the inclusion of STEM related subjects and career routes: further and higher education; industry and education partnerships; and, interventions into career management skills.
4. To trial the new SoE model via a school-based pilot activity.

II. Process

In speaking to industry and public services, it helps to talk about design in the broadest terms. In the realm of education, design can be described as the creation and execution of a plan, or the very nature of a new creation such as a model, for new ways of working together to deliver learning programmes. The process should really be about good design, i.e. design that is appropriate to the purpose, which in this context involves discussions about curriculum, career routes and strategies for skills provision, industry sectors, and partnership working. Seen from that point of view, the route is really about designing or redesigning learning communities.

The Designing Transformations project was nine months in duration and consisted of a series of design-led activities including partner events (Consultation + Discovery) and working sessions. Co-creation techniques were employed to involve users and front-line workers in the design process thus enabling the capture of their own ideas, knowledge and expertise (Figure 1). The activities generated insights and ideas that shaped the pilot programme, could be mapped against the curriculum (Synthesise + Define), and then served to inform the new SoE model (Develop + Prototype). Essentially, the SoE model did not precede the pilot, but co-ceded.

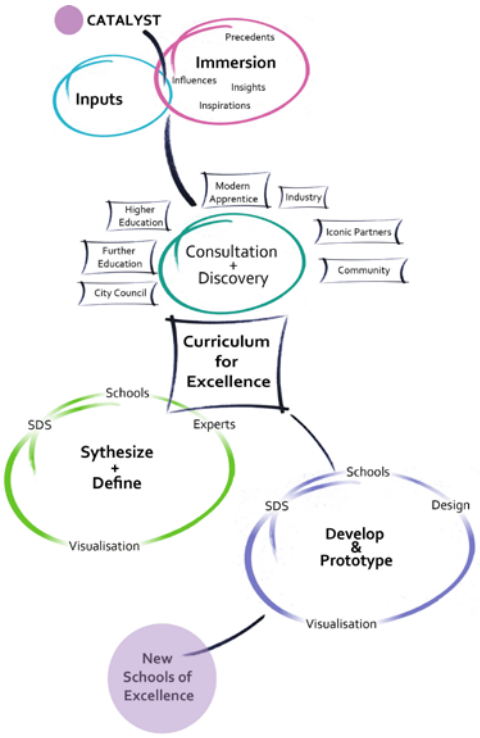


Fig. 1: Project schematic showing the design-led collaborative activities undertaken to generate a new SoE model.

The range of methodologies adapted and applied in the early stages of the project included ethnography (cultural probes Fig. 2) and co-design workshops to gather insights, and design visualization to communicate and synthesise the findings. Design thinking was central to generate ideas, to inform the underlying framework, and to build relationships with partners. Design prototyping in the pilot programme used low fidelity human space-simulation activities as a means for engaging young students (ages 11-14) in STEM subjects and as an ideal platform for widening the scope of the interrelated disciplines and engaging the learning community.

II.I Visual Ethnography

Each year, a select group of Secondary 5 (aged 16-17 years) students are chosen to attend the Scottish Space School weeklong Space Camp in Houston, USA. This experience is considered one of the main awards and offers each student a unique and memorable experience. The 2009 SDS NASA/Houston visit had ten Secondary 5 students and four Modern Apprentices (aged 16+ years) participate. A Cultural probe pack, an ethnographic tool used to gather insights, was developed and distributed to each participant. Cultural probes are collections of evocative tasks that are intended to elicit inspirational responses and clues about the thoughts of participants during a given experience. In this instance, ethnography was a design-led research method used to gather information and insights from the students attending the 2009 Space Camp, with the findings used at the outset of the co-creation process to inform the workshop themes.

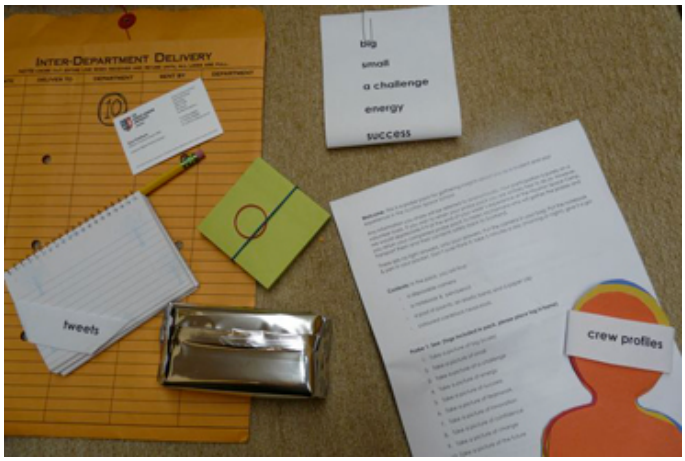


Fig. 2: Cultural Probe Pack distributed to all 2009 Houston Space Camp participants contained instructions and a range of bespoke activities and objects.

Cultural probe results are not analyzed collectively or in a summative way, but are instead reviewed individually with content drawn from the user's insights and perspectives, as reflected in the outputs of the completed tasks [10]. They tend to include open statements or thoughtful recollections by participants in response to research questions packaged as rich and engaging tasks. They result in qualitative data or rich outcomes that result from an individual engaging by choice and over time.

The returned packs offered numerous insights into contemporary themes and topics identified by the young adults. A review of the findings revealed that a number of entries cited water, global health issues (specifically 'illnesses' and 'cures'), and energy and natural resources, with these themes offering potential as probes for further enquiry. Images and created objects arising out of the cultural probe activities revealed thoughtful reflection on the space camp activities and awareness of the broader perspectives of space exploration. Interesting results were seen in the crew composition task, where the participant responses suggested that individuals of influence could be both family and iconic individuals.

II.II Participatory Design: Co-Creation

The first consultative event was a visioning workshop: Schools (World of Learning) offering tasks to facilitate reflection on personal learning journeys and elicit **insights, inspirations and influences** in the context of Space. A total of 24 participants attended from a broad complement of learning partners and contributing institutions (Pilot School, HE Institutions, Careers Advisory, Local Council, and Skills Development Scotland Strategic Programmers). Two intensive working group sessions focused on scoping and mapping ideas linked to three key themes (Water for life, Energy and Natural Resources, and Communication). The second consultative event focussed on Partnerships using themes: **Expertise, Industries and Modes of Engagement**. It set out to answer the question – "*How can we broker broad-themed hooks such as 'Space' for other Schools of Excellence?*" A total of 20 participants attended and represented the range of Partners: Schools, HE (representing Art, Design and Media, Computers, Engineering, Bioengineering, Architecture, and Communications), Industry, Local Council, and Community. Activities used image-based cards as a means to prompt and facilitate reflection on personal strengths and expertise and to elicit insights into the concepts of **Transformation, Aspiration and Success**.

II.III Visualization: Project Space

Figure 3 reveals the large-scale mind map termed 'Project Space'. This visualization was developed to capture and convey themes arising out of the cultural probe packs, ideas from contributing Schools and Partners, and outputs from the workshops. It is included here to convey the general co-creation process, rather than specific content, hence why this large format visualization proves unreadable in the scale shown. The mind map helped to exhibit relationships between the various space-related influences and insights and it served as a functional framework for documenting partner contributions and process. The section view (Fig 3.b) shows some of the content and conveys how the output generated was mapped to cross-curricular themes for carry forward into design development and intervention.

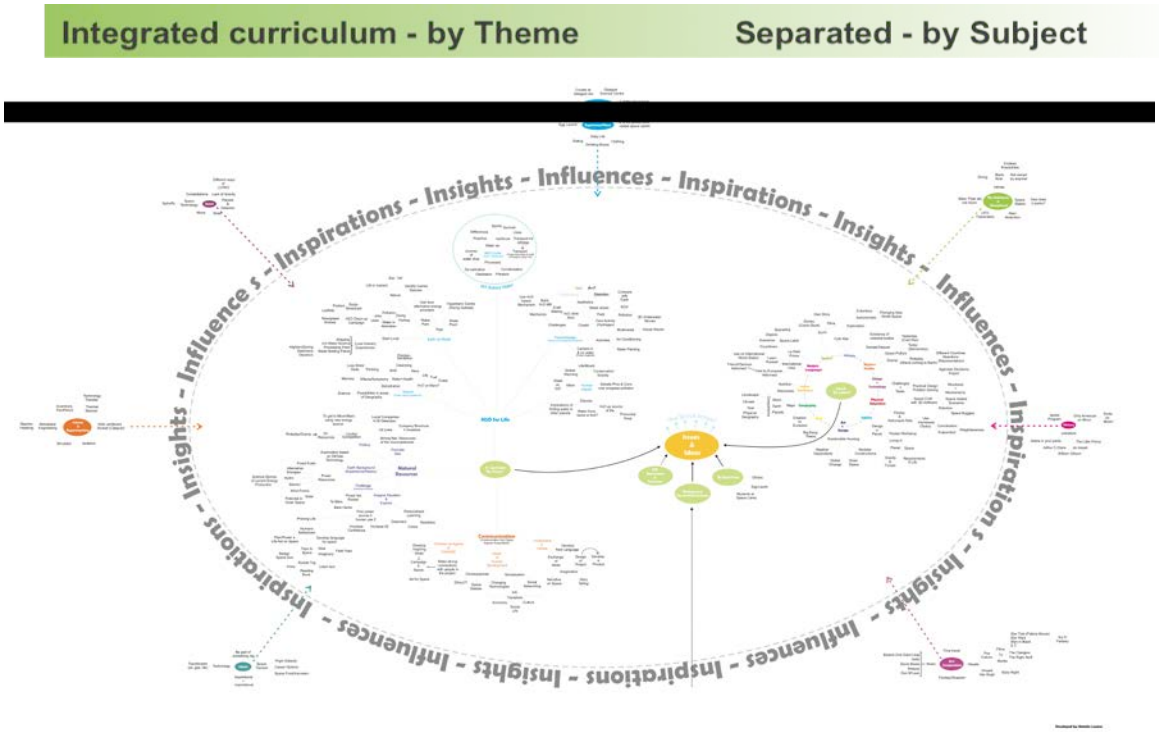


Fig. 3. Project Space – a large-scale mind map for visualizing and synthesizing partner contributions and programme development (Image by N. Lozano).

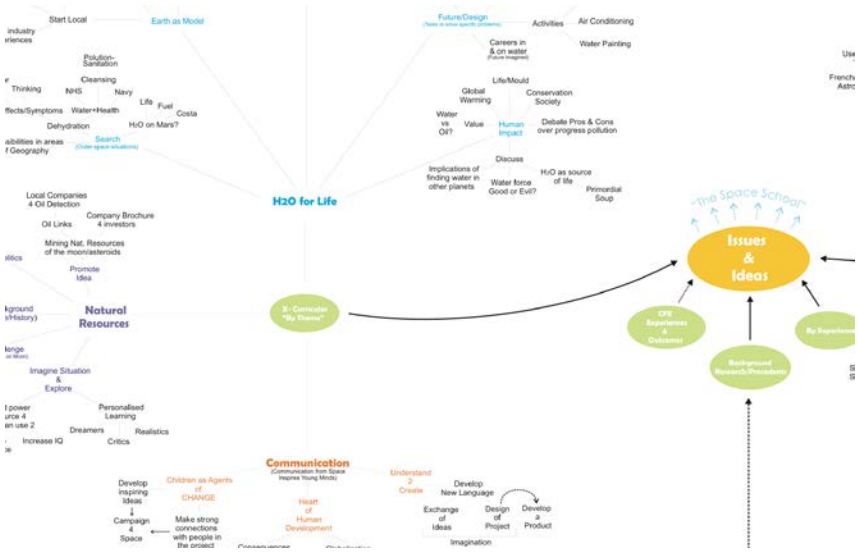


Fig. 3b. Section view of Project Space showing idea generation by cross-curricular themes (Resources, Water for Life, and Communication).

II.IV Demographics

The SoE project was based in Aberdeen, a city of approximately 200,000 in Northeast Scotland. The local city council chose Torry Academy as the location for the pilot programme, a school within a regeneration zone with a high degree of international students and higher than average levels of poverty, unemployment and deprivation. Over the past five years – the demographics from the Government of Scotland's 2008-09 School Leavers Destination Report [11] revealed that school leavers from Torry Academy have remained in the community or Aberdeen area, either going on to Further Education (FE) (e.g. local College) or directly into employment (e.g. industry based training with modern apprentices). Statistics drawn from the 2008-09 report indicate that of the 81 school leavers in 2008, only 18.5% went on to Higher Education, which was almost half as many as the average nationally in Scotland (34.9%). Torry Academy had a higher unemployment rate (25.9%) as compared to Aberdeen city (12.6%) and across Scotland (11.5%).

II.V Design Intervention: Simulation

Simulations are used in many training applications: healthcare, safety, social services, and education, among others. Facilities that simulate human space missions, or aspects thereof, are referred to as simulators, with early examples including Skylab Mobile Laboratory (SML) while more recent examples include virtual simulators like the Interactive Mars Habitat and future simulators such as Mars500 [12]. An example of the use of simulated space environments for educational purposes is Robomath [13] developed in collaboration with Astronaut Julie Payette from the Canadian Space Agency, which is a virtual space environment where pupils learn mathematical concepts in the 3D environment of the International Space Station.

Simulators are sometimes described in terms of their 'fidelity' or their ability to simulate or produce an experience, with those that produce likely performance or behaviours termed "high-fidelity" as opposed to "low-fidelity" simulations producing only some basic signs of possible performance, but the distinction of fidelity is mainly dependent on the context of a given scenario. The pilot programme built on a key statement from Scotland's Curriculum for Excellence (CfE) which states that "…*opportunities to develop skills may be offered in different ways appropriate to learners' needs, whether through active learning, interdisciplinary tasks or the experience of learning in practical*

contexts...' [9] With the opportunities afforded by CfE, and the premise that opportunities should be open to all children/young people, the SoE pilot endeavoured to democratize discrete aspects of a space exploration experience and in doing so it aimed to provide a range of inclusive educational activities accessible to all abilities.

Contextually, the SoE pilot programme pursued the concept of low fidelity space simulations, but practically, it offered aspects of 'hacked' space experiences for the purpose of inspiration, engagement and education. The 'hacker' aspect is key to the programme's sustainability as the use of off-the-shelf and existing resources, and the ability to mock-up activities within different school environments, is what enables the programme to be accessible and adaptable, and tailored to a given school's objectives and learning community.

III. Prototype

III.I Schools of Excellence (a New Model for SoE)

Designing Transformations led to a new model for a learning journey, as shown in Figure 4, where Schools of Excellence arise out of an educational framework that uses broad themes, catalysts, or 'hooks' such as Space, to engage students. A School of Excellence, such as the Scottish Space School, can also be linked to an iconic partner, such as NASA or ESA, so that at their foundation there is a model for partnership working. But ultimately, Schools of Excellence begin in the early years to inspire young learners to strive for personal excellence and build strengths key to their own success, to engage with a broad learning community (Industry, FE, HE, etc.), and to heed influencing moments as the defining launch points in their lifelong learning journey.

Influencing moments are those lasting, impressionable moments that gel ideas, people, and knowledge in such a way as to strengthen our connection and influence our thinking. These experiences are characterised by their 'difference' in relation to their usual surroundings or context. The lower aspect of Figure 4 conveys the 'differences' by the size & arrangement of **launch points**, while the shaded area conveys the bandwidth of learning within the normal curriculum. The activities above the bandwidth would take place within the school environment, while those below the bandwidth would take place outwith the school. For example, in the context of the pilot 'Space Day', the programme was characterised by the thematic approach to the event, the presence and accessibility for students of a key iconic partner, the shared delivery between staff of the School and individuals from other agencies, and the use of low-fidelity simulation-based activities, all occurring within the school environment. In this case NASA was the key iconic partner, and the individual player within this was the 'Astronaut', and the activities delivered experiences accessible by all abilities. Other examples of launch points shown, include a 'portfolio of events' and an 'immersion' experience, the latter which may include an internship or clerkship.

A **Learning journey** is a continuous experience from early years of primary school through to Secondary School and into FE & HE and beyond – with encounters, experiences, and influencing moments along the way that guide and influence a young person's decision making about who they are, what they wish to be, and how they plan to achieve. Each influencing moment along the journey is a potential catalyst to an opportunity to step out of the regular school day and engage in a learning experience. **Launch points** offer spin-offs into other directions – e.g. parallel to learning journey (world of work, life and learning- imagine each as a journey – crossing over at certain times) and the end point being a young adult with an inherently flexible and collective lifelong learning journey. **Career agility. Learning agility. Lifelong confidence.**

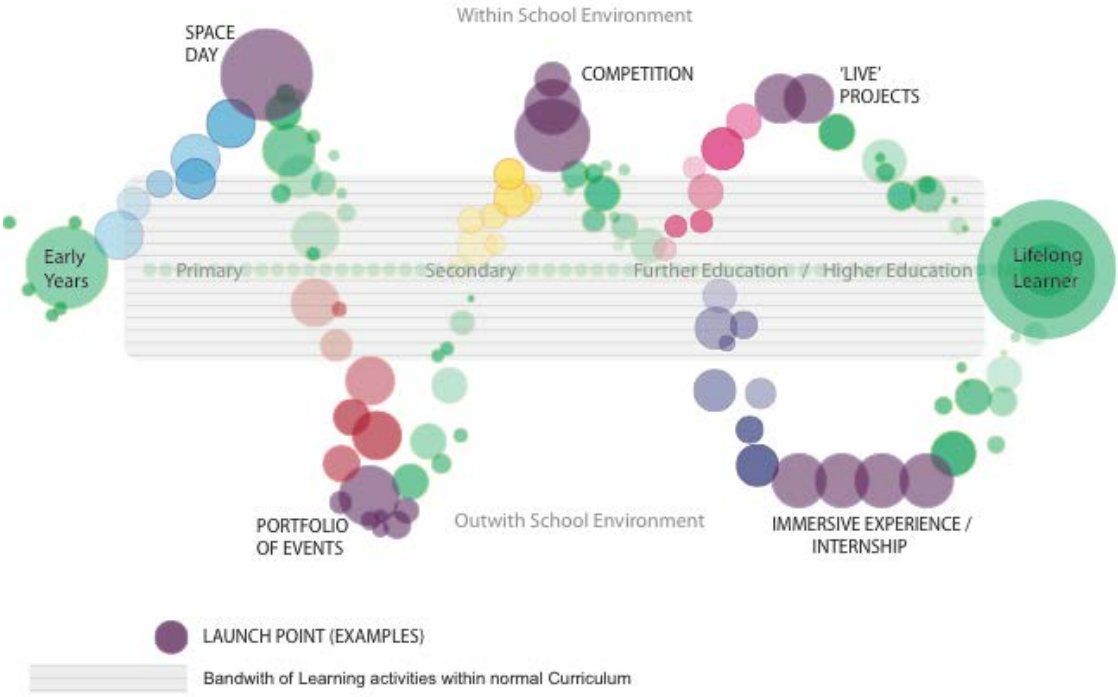


Fig. 4: A conceptual model of a Learning Journey that offers a 'portfolio' of connected 'influencing' activities delivered by the learning community, that are termed Launch Points.

The catalyst theme for testing the new SoE model at this point in time has been Space, as shown at the top of Figure 5, however the model allows for the development of multiple catalysts that arise in collaboration with partners. Indeed the model sees the role of a national agency such as Skills Development Scotland as a strategic interventionist bringing together key partners from industry and education to engage in workshop activity and to explore opportunities to influence the development and delivery of learning communities. Curriculum for Excellence is an educational framework that enables 'joined-up thinking' – both across curriculum areas and across the learning 'time span' while visualization through the mapping activity facilitates creativity in the development stage of the model by avoiding the direct correlation of activity to skill, thereby enabling the development of big and bold ideas across the learning stages.

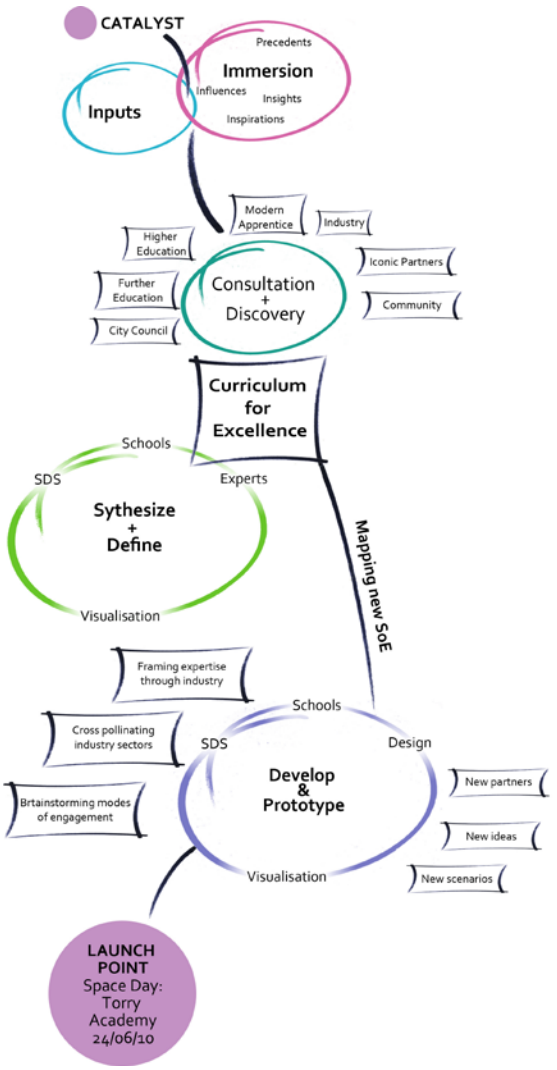


Fig. 5: New Schools of Excellence model conveying a methodology to enhance the delivery of curriculum by bringing together key partners with a 'catalyst' to facilitate discovery, definition and development of Launch points such as 'Space Day'.

The output for the SoE pilot resulted in a single one- day programme of activities. This was not connected to a series or a portfolio of events but the SoE model would enable other modes of engagement and patterns of activity to be developed as working groups see fit. In this respect, the pilot 'launch point' was a singular 'launch point'; the development of a series of 'launch points' to take a young person through a period of their academic career would constitute an ideal for the SoE model, whereby partnership working becomes a fundamental part of delivering the curriculum. In this respect the curriculum becomes 'networked' and connected over a far longer time span building long-term relationships with industry and other agencies.

Some of the key skills for the 21st-century are investigation, responsibility, and the ability to synthesize experiences. Building on this and based on a proposed model that is cross-curricular in nature, the Space Day 2010 programme conveyed a selection of experiences designed to explore the societal, cultural and environmental contexts of space as they relate to the world of learning and the world of work, thus moving the curriculum from isolated to engaged.

Review of the content in the Project Space (Fig. 5) enabled the critical consideration of ideas generated by the first consultative event alongside outputs from the second event. A series of partner working sessions held over an eight-week period resulted in the synthesis of the Project Space outputs into roughly ten proposed "rich task" ideas. Outputs were visualized and mapped to the curriculum before being presented to a focus group for selection via a cluster and vote activity. Five ideas were taken forward into programme and lesson development.

III.II Rich Task

A "Rich Task" is a task that involves both process and product and can usually embody a term's worth of learning in various areas, under the guise of 'integrated studies' [14]. The main reasons for this approach are; it caters for different levels of ability, it requires both creative and critical thinking as the pupil endeavors to solve problems, it provides the opportunity for wide study and learning from a wide selection of areas (e.g. sciences, personal management, communication and technology), and it presents tasks that are relevant to the broader world (both local and global), thus providing engaging and relevant experiences. This approach was believed to be of value in the lead-up weeks as the missing ingredient to maximize student engagement and emphasize the relevance to the main feature: "Space Day".

Each idea was mapped to CfE experiences and outcomes, which took into account both the rich tasks (lead-up activities) and the corresponding Space Day programme. Outcome statements are written descriptions representing what is to be achieved as a result of a learning experience [15]. It can be seen that using broad themes enables a given learning contribution to map to outcomes across curriculum areas. As an example, the following five outcome statements were mapped to the Space|Time Capsule activity which was selected as part of the final pilot programme.

To show my understanding, I can respond to literal, inferential and evaluative questions and other close reading tasks and can create different kinds of questions of my own. ***English (ENG) 2-17a***

I have the opportunity to choose and explore an extended range of media and technologies to create images and objects, comparing and combining them for specific tasks. ***Design & Technologies (EXA) 2-02a***

I can show my understanding of what I listen to or watch by responding to literal, inferential, evaluative and other types of questions, and by asking different kinds of questions of my own. ***Literacy (LIT) 2-07a Responsibility of all***

Using simple time periods, I can give a good estimate of how long a journey should take, based on my knowledge of the link between time, speed and distance. ***Numeracy (MNU) 2-10c Responsibility of all***

By observing or researching features of our solar system, I can use simple models to communicate my understanding of size, scale, time and relative motion within it. ***Sciences (SCN) 2-06a***

There was strong cross-curricular representation in the outcome statements across the ten proposed ideas, with all of the ideas mapped to outcomes in at least four curricular areas and many mapped to more than four areas. The most common curriculum areas that were mapped to included Literacy (LIT), Numeracy (MNU), Health and Well-Being across learning outcomes assessable in all, as well as Sciences (SCN). In addition, outcomes in Art, Design & Technologies (EXA), English (ENG), Modern Languages, and Religious and Moral Education (RME) were assessable in many thereby going beyond STEM curriculum.

Staging the activities via a collapsed curriculum day for all Primary-7 and Secondary-1 (10-13 year olds) students provided further opportunity to offer an inclusive, engaging experience at an influencing time in a pupil's life: transition from primary to secondary school. "*Transition is not just about settling*

in. It satisfies an appetite for learning" [16]. It has been observed that when young people transition to first year Secondary school they are more confident and ready to be challenged when the transition is collaborative, creative and challenging.

III.III Space Day Pilot Programme

In its final programmatic form, the SoE pilot Launch Point used the theme of Space as an educational engagement model and career skills tool to engage 200+ young students of all abilities. The pilot project was a collaborative activity between Gray's School of Art, Robert Gordon University, Skills Development Scotland, Torry Academy and Associated Primary School Groups, Industry representatives, Modern Apprentices, SHMU/Community Radio, the City of Aberdeen, the Scottish Space School, and expert guests from NASA.

The programme presented below represents one iteration of a Launch Point using the theme of Space as a 'hook' to engage and inspire young adults through a set of cross-curricular activities using low-fidelity simulations, group discussion, individual reflection and question-time with a panel of experts.

A: Living in Space: a three-part activity.

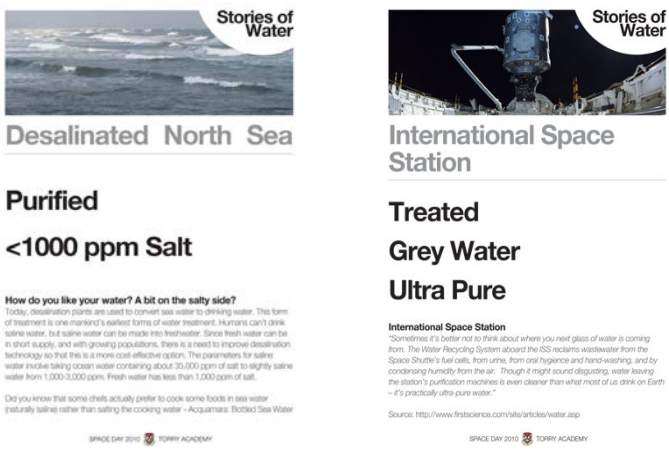
A1. Doorways in Space – This activity explores the shapes, sizes, and cultural associations of doorways in various contexts (residential, commercial, emergency) and various environments including Space. In lead-up activities, pupils view images and discuss the relationship between bodily posture, cultural associations, and doorways/portals in a gravity-rich environment. The Space Day activity saw over 200 pupils trialing different shapes of doorways in a highly energetic setting (Fig. 6a,b), including a task offering simulated weightlessness through a team-based physical activity.

a) b)

Fig. 6a,b: Doorways in Space – Images showing a sampling of door configurations - rectilinear (a) and circular (b) - achieved with basic gymnasium equipment and trialled with large class groups.

A2. Alien Dining –Exploring language, culture, and space food and a simulation of what it would be like to share an intercultural, multilingual meal aboard the International Space Station (ISS), this activity involves both discussion and a shared-dining experience simulating close proximity and confinement in a heterogenic group setting. Lead-up activities in the weeks preceding Space Day explored communication, modern languages, diet and culture, and the architecture of shared social situations.

A3. Stories of Water – A discussion-based activity encouraging pupils to challenge their perceptions of the sources of the water we drink using story, sight, scent and taste. The lead-up activities build on the topics of the water cycle and water filtration, which are common activities in early Secondary school science. The Space Day activity asked students to observe the differences in the way different water samples looked (colour, clarity, etc.) while listening to a set of 'stories' about each sample's origin (Fig 7a and b). Samples were enhanced to achieve specific sensory effects and students were asked to taste and rate each sample. Following the tasting, students were encouraged to discuss their perceptions relative to their experience of a given water sample.



a) **b)**

Fig 7. Examples of the Stories of Water information boards that accompanied the simulated water samples.

B: Remote Explorer: A set of three activities to convey the challenges of human versus robot exploration of Mars. The Mars rovers were built from a low-cost kit ($15 USD/£10) assembled by students along with deck-plates designed by the students in the preceding weeks. The activities on Space Day are developed to progressively expose students to communication, Geography, Geology, Engineering (design, development, maintenance and operations) in remote exploration. Lastly a mission scenario was offered whereby students could adopt specific mission roles and responsibilities aligned to given to career fields.

C: Space | Time Capsule. This activity offers an opportunity to reflect on what is important to a pupil now and to help them visualize their future life and career (2010, 2015 and 2020). In the Pilot programme, a list of questions were presented in advance of Space Day, discussed in the classroom, and then completed by pupils using the capsule template (Fig. 8a). Questions were themed about the 'future self', achievements, abilities, learning, favourites, and persons of influence. Students were encouraged to augment the capsules with drawings, text, graffiti, or any other meaningful images along with a photo of themselves. Capsules were constructed and then assembled for a common display in the School at the end of Space Day (Fig. 8b-c). Over 200+ capsules were put in dry storage at the pilot school, which will be retrieved and shared with the pupils in 2-3 years when they embark on their subject choices and engage in career management skills-based activities.

a) b) c)

Fig. 8a-c: Space | Time Capsule template and images of completed capsules on display at Pilot School.

D: "A Pocketful of Questions": A rotating small group Question and Answer session with a panel of experts. Each student has the opportunity to ask at least one question if groups are based on an approximate 10:1 ratio (10 students to 1 expert). During each Space Day activity, pupils were encouraged to write down questions to ask during this Panel-formatted session. Each expert was provided with a large format 'Billboard' offering background career information along with 'sparks' ('sparks' are questions to initiate discussion, as provided by the experts).

IV. Discussion

This paper cites a single iteration arising from the proposed new SoE model: an evolved model which explored the potential for the theme of Space and other thematic 'hooks' to engage and inspire young people through increased partnership working in learning communities. As a pilot activity, monitoring and evaluation was considered and while an evaluation was undertaken, the main focus of it was to assess the degree of engagement, impact, and feedback on the sustainability of the programme. Within days of the event, a questionnaire was distributed to all participating students and Partners, and follow-up interviews were held with a representative of each of the key Partners (Pilot School, Higher Education, Industry, and Skills Development Scotland). Feedback from pupils, activity leaders and teaching staff was overwhelmingly positive while also being constructive for informing future Space Day events. The sustainable nature of the activities developed for the event were also considered a success as the pilot school had reportedly already adopted some of the activities, have broadened their learning community to include local industry and an Iconic partner and have integrated the CfE-mapped resources into their 2010-11 curriculum.

Following the evaluation, there was an opportunity to reflect on the questions posed at the start:

How can we create ways of working together to enrich the learning community? The project allowed fresh thinking around an existing model of using inspirational/iconic partners as a hook for young people to consider careers in STEM which they might not otherwise have considered, by bringing together stakeholders and practitioners from outwith the STEM community and from within. This allowed for a creative synthesis of ideas and approaches. From the perspective of the lead agency SDS, Launch points, industry pairings, and mind map visualisation are considered some of the most important influences and outcomes of the whole project, and have been identified as those that will inform their approach to tools, approaches and partnership work for the key industries and beyond.

How can we create new ways of getting young people hooked into learning at all stages of their journey? The new SoE model seeks new ways to inspire young learners to strive for excellence and build strengths key to their own success; engage with a broad learning community (Industry, Community, Further Education (FE), Higher Education (HE), etc.); and heed influencing moments as the defining launch points in their learning experience. The lead-up activities and one-day pilot programme can be seen as the start of a journey, or as the first launch, and essentially engages the young person on day one. As this pilot was a singular 'launch point', the development of a series of 'launch points' to take a student through a period of their academic career would constitute an ideal for the SoE model whereby partnership working becomes a fundamental part of delivery of the curriculum. In this respect the next step is the development of further SoE 'launch points' to support a learning journey that is 'networked' and connected over a far longer time span building long-term relationships between schools, industry and other agencies.

V. Conclusions

All young minds need the confidence and ability to make learning and career choices that will best serve them in the world of work. What lies behind the ability to make choices is the broadening and

enrichment of the learning journey and the learning community. The Designing Transformations Project has taken the first step to using applied creativity to generate answers to some early questions and to evaluating a case study: the Schools of Excellence (SoE) Pilot Project – Space Day.

The key findings arising out of Designing Transformations were generated by the use of design research methods throughout the project which led to important input – at insight, ideas generation, relationships, cross-curricular synthesis and solutions – and opened up the obvious links between art, technology and science. In regards to the learning community, it was observed that Partners who inspire don't need to be world-renowned/global or indeed on the other side of the world. The project helped to demonstrate that Ideas around partnership, strategic interventions to bring this together, launch points, collapsed curriculum, and whole school activity, could all become sustainable and transferrable learning innovations. What lies ahead is the opportunity for further research into the impact of influencing moments before pupils make choices.

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Vitae:

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