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SPECIAL ISSUE
Science communication in unexpected places

PRACTICE INSIGHTS

Exploring science with children from under-represented groups through shared interests: insights from a decade of practice

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Abstract

Through a series of projects dating back to 2015, the Science Hunters programme has delivered eight 'Minecraft Clubs' to engage children with Special Educational Needs, care-experienced children, and children in low socioeconomic status areas with science, technology, engineering, and maths. Science concepts are used as themes to build around, rather than the key focus of the activity, which is communal gameplay and having fun. Delivery has been developed through reflective practice, insights from which are drawn upon to extract key takeaways for engaging children with science outside of traditional settings through community-based activities and existing interests. These include drawing on the experiences of those with relevant backgrounds in design and delivery approaches, embedding STEM content rather than making it a primary feature of the activity, seeking and incorporating participants' input, and having alternative approaches and resources available to facilitate accommodation of different needs and circumstances.

Keywords

Diversity; equity; inclusion and accessibility in science communication; Informal learning; Social inclusion

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1 ▪ Context

With the aim of raising science capital [Archer et al., 2012], the Science Hunters programme harnesses the ability of the computer game Minecraft to recreate real-world biomes and processes in shared virtual environments, to engage children who may face educational access barriers with science, technology, engineering, and maths (STEM). Science topics are embedded within themes to build around for players of a game, rather than being the main focus of the activity. Dialogic topic introductions at the start of each session, including real-world examples and practical activities, are followed by exploratory child-led Minecraft 'tasks' or 'challenges' that have no specified end point or 'correct answer' [the pedagogical approach is detailed in Hobbs, Stevens, Hartley, Ashby, Jackson et al., 2019]. Beyond this, activity is participants' choice; the emphasis is on self-directed creativity, inclusivity, and collaboration to construct understanding and meaning within the context of playing the game. While children are learning and engaging with scientific concepts and thinking, they may not be actively aware that they are doing so, and the focus is on their enjoyment. Activities have a core target age range of 7–14 years, although children of any age can take part and sessions are highly adaptable to participants' needs. Overall, this strategy, which has been developed and refined over time, promotes learning through building on participants' existing knowledge within the framework of defined topics and using their interests as a springboard. Evaluation has indicated that the use of Minecraft can effectively draw children into engaging with scientific topics [Hobbs, Stevens, Hartley, Ashby, Lea et al., 2019], and that participation can deliver increases in subject knowledge and understanding [Hobbs, Stevens, Hartley, Ashby, Jackson et al., 2019; Hartley et al., 2023].

Alongside provision in other settings, since 2015 eight 'Minecraft Clubs' (MCs) have been delivered as community-based social activities through collaboration with local community groups and charities, libraries and other local authority provision in the Northwest, Southwest, and Midlands areas of England. Not only can out-of-school science activities promote children's interest in STEM and science identities from a young age [Burke & Navas Iannini, 2021; McDonald et al., 2023], "affinity spaces" for people connected by a shared interest or passion, of which video games are a recognised example, offer opportunities for effective skills and knowledge development [Gee, 2018]. Following Gee's model, Minecraft acts as such an affinity space as a shared interest of MC attendees, while the shared community-based club itself acts as a smaller affinity space within this.

1.1 ▪ *Learning model*

Participation is voluntary, motivated by attendees' interests and participants may not recognise that they are learning. While adults support children and ensure a welcoming environment, children are ultimately left to play in Minecraft according to their interests and abilities [Hobbs et al., 2020]; both video games and interest-based clubs can support powerful learning opportunities [Gee, 2008; Gee, 2018]. However, while a discussion of conceptualisation of formal, non-formal and informal learning, the overlap between informal and non-formal learning and detailed positioning of these activities is outside the scope of this insight, it should be noted that there is some structure and adult-led element to the sessions (and, while MCs do not take place in formal education settings, other Science Hunters activities following the same approach do). As such, aspects of the approach align with informal learning, and the less well-defined non-formal learning, as outlined by Johnson and Majewska [2022] in their review. Here, we focus instead on practical considerations that support facilitation of science engagement that occurs within an ‘unexpected place’, in the context of community-based (rather than educational, or science-based) settings and activities developed around common interests and experiences.

2 ▪ Methodology

2.1 ▪ *Reflective practice*

Drawing on principles from participatory action research and design-based research, frameworks which support improving practice and developing transferable principles for inclusive engagement [Design-Based Research Collective, 2003; Reason & Bradbury, 2008], MCs have been co-developed and iteratively refined through collaboration with relevant professionals and community leaders, parents and carers, and young participants. Throughout this period, we have utilised a process of reflective practice; by observing, analysing then theorising about our experiences, in line with Kolb’s [1984] experiential learning model, we were able to consciously take action which in turn led to new experiences and knowledge development in a cycle of experience-reflection-action [Jasper, 2013]. Schön’s [1983] concept of the reflective practitioner further underpinned this process, viewing facilitators as professionals who learned and theorised through doing. Grounded in a critical-pragmatic paradigm, this approach recognises that meaningful knowledge arises through collaborative action rather than detached observation, and that reflection and practice are inseparable in generating understanding. As such, through delivering activities, gathering feedback, discussing issues and considering wider context (e.g. social factors and organisational structures), we were able to operate as reflexive facilitators (interpreting outcomes and adapting experiences rather than simply reflecting on and learning from them) with knowledge developed through co-creation and contextual interpretation [Jasper, 2013; Bolton & Delderfield, 2018]. This epistemological orientation supports the programme’s commitment to equitable outreach and empowerment.

2.2 ▪ *Extraction of key learning*

Here, we draw upon this reflective practice to summarise knowledge developed over a decade of experience of designing, initiating, delivering and refining these clubs (Figure 1). This incorporates all elements of our experience-action-reflection cycles, including aspects relating to practical details of delivery such as logistical factors, session plans and resources, the information used in original reflections including practitioner observations, formal evaluations and continuous participant, parent/carer and partner feedback, and the refining actions taken, which form our knowledge base. While some practical aspects of delivery are specific to the use of Minecraft as an engagement tool and ‘unexpected place’ to encounter science, others relate to engaging children with science through their existing activities and interests. We collaboratively reviewed these learning outcomes via iterative discussion through the lens of four core questions to explore practical insights into facilitating science communication for children in non-conventional spaces through shared interests (What have been the main challenges? Why were these an issue? How were they mitigated? What key takeaways apply?) leading to a summary of knowledge.

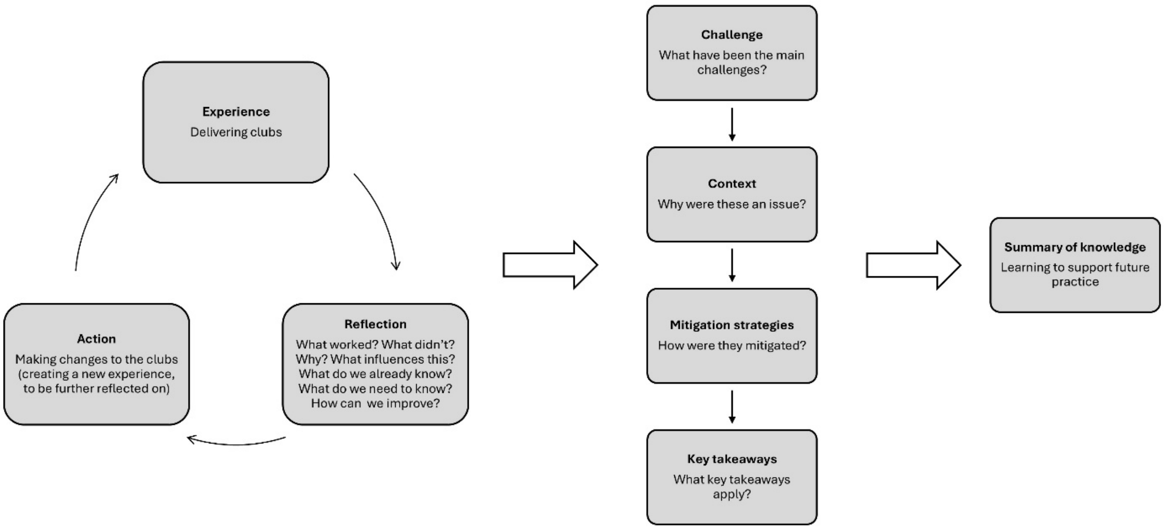

Figure 1. The approach used to summarise knowledge gained through practice delivering Minecraft Clubs. Clubs were iteratively refined through a cycle of experience-reflection-action [Jasper, 2013]. This knowledge base, as developed between 2015 and 2025, was then further reflected on through collaborative review using four core questions. These outcomes were then summarised into key learning points to support future practice.

3 ▪ Delivering and refining the Minecraft Clubs

3.1 ▪ *Using Minecraft for science engagement*

Digital game-based learning has been utilised for several decades [e.g. Prensky, 2001; Gee, 2008; Alawajee & Delafield-Butt, 2021]. Minecraft is an exploratory, construction-based game offering almost unlimited building opportunities in a wide range of virtual settings and has been described both as one of the most important games of the current generation [Lane & Yi, 2017] and an instance of Papert's [1980] 'object to think with' [Kuhn, 2018]. Its various real-world analogies and the ability to interact with (and modify) environments make it an ideal tool for exploring both scientific concepts and real-world problem solving [e.g. Ekaputra et al., 2013; Nebel et al., 2016; Hobbs, Stevens, Hartley, Ashby, Jackson et al., 2019; Bile, 2022]. In particular, Minecraft enables players to actively engage with challenges and environments that would otherwise be impossible to physically access (e.g. traversing an active volcano). Furthermore, the game offers social and collaborative learning experiences [e.g. Kervin et al., 2015; Nebel et al., 2016; Ringland et al., 2016; Baek et al., 2020; Bile, 2022; Martinez et al., 2022] and can support children's engagement with abstract concepts [Nkadimeng & Ankiewicz, 2022; Tablatin et al., 2023]. A general explanation of learning theories associated with Minecraft Education can be found in Nkadimeng and Ankiewicz [2022].

3.2 ▪ *The initial club*

The first MC was established in 2015 as a fortnightly activity, initially in collaboration with a local charity branch, before widening to include any children with Special Educational Needs (SEN) in the area. Video games have the potential to facilitate social, emotional, and cognitive competencies [Granic et al., 2014], and Minecraft is particularly appealing to those with SEN due to its features [Jiménez-Porta & Diez-Martínez, 2018] and as a shared special interest [Ringland et al., 2016; Cadieux & Keenan, 2020]. Most attending children presented with autism, Attention Deficit Hyperactivity Disorder, and/or dyslexia [Hobbs et al., 2020], across which challenges associated with interaction, confidence, and attention can occur [Tseng & Gau, 2013; Bathelt et al., 2018; Livingston et al., 2018; American Psychiatric Association, 2022].

The club was developed to provide a safe and supportive space for children with SEN to engage with science topics through playing Minecraft. Use of a dedicated server enabled children to play together in a private virtual environment, facilitating safe interaction, communication, and opportunities for developing collaboration skills [Kervin et al., 2015]. Allowing children to engage in shared virtual play in the same physical space effectively strengthened connections between digital and face-to-face social relationships [Hobbs et al., 2020], addressing a concern of parents of children with SEN [Zolyomi & Schmalz, 2017]. Children were accompanied by parents/carers and attendance numbers were deliberately limited to ensure the environment remained manageable for a range of needs and did not become overwhelming for participants. Science content varied across sessions and participants were able to request specific topics. Attendees were encouraged to give feedback, anonymously if they wished; requests for adjustments (e.g. to noise levels or room temperature) were acted on and in the interests of maintaining a safe and enjoyable environment for all attendees, a brief set of participant-informed guidelines were established to support accommodation of needs [Hobbs et al., 2020].

A fuller explanation of the rationale for establishing a club for children with SEN and detailed insights from the first four years of this initial club can be found in Hobbs et al. [2020]. Evaluation showed that attendees consistently enjoyed attending, with most children and their caregivers feeling that they had developed scientific knowledge, social-communication skills, built new friendships, and increased in confidence. The accepting and inclusive nature of the club was highly valued, as was the approach to communicating science content [Hobbs, Stevens, Hartley & Hartley, 2019; Hobbs et al., 2020].

3.3 ▪ *Expanding the clubs*

The success of the initial MC elicited requests from other organisations and initiation of new provision. A key example, resulting from a long-term collaboration with a Local Authority team, is an online club established in 2018 as part of school holiday provision for care-experienced children in a county with a high proportion of rural residents. As in the initial club, attendees were able to suggest and request topics to be covered and were encouraged to engage in self-directed activity. Participant communication and logistics were handled by the liaising team, which was especially important for maintaining participant privacy.

In 2020, ‘Building to Break Barriers’ was initiated as a new Science Hunters project, which included plans to continue and expand MC provision. The project launched in May, unfortunately coinciding with the COVID-19 pandemic. While plans for the online club for care-experienced children were not directly disrupted (besides wider difficulties, such as impacts on staffing), plans for new provision were delayed and the existing club for children with SEN could not continue in its existing form due to the suspension of face-to-face activities and the end of original institutional support in July 2020. Consequently, sessions were moved online, utilising insights from the existing online provision for care-experienced children.

This rapid change in format brought both challenges and benefits. It was necessary to navigate seemingly contradictory impacts — some children found the new format to be difficult or confusing, while others benefited from the removal of pressures associated with being in a room with others. Although the club remained a tolerant, supportive space, it was impossible to recreate the benefits of engaging with science in the same physical location and opportunities for social communication and interaction [as outlined in Hobbs et al., 2020] were inevitably reduced. However, working remotely prevented major disruption to scheduling, despite changing COVID restrictions, and enabled more vulnerable people to attend.

With the end of funding in 2022, the initial MC was brought to a close after seven years of delivery. The structure and routine of the club were key components of its success and suitability, and with the loss of institutional support and lack of stability inherent in external project-based funding, it was decided that clarity and predictability were paramount for participating children. As such, the most responsible course was to create a clear end point to the club, rather than maintaining potentially stressful uncertainty for both existing and new attendees.

3.4 ▪ *Moving forward*

From 2023 onwards, new MCs were established in low socioeconomic status (SES) areas as part of the ‘Engineering for Sustainable Societies’ project. These clubs were delivered in collaboration with local community organisations (including a charity for children with Special Educational Needs and Disabilities) and libraries, who were keen to take part due to factors such as a lack of local provision, or because they had few existing STEM-based activities. Clubs were well-received by both attendees and staff as they increased library utilisation, developed skills for group leaders, and provided engagement opportunities that would not have otherwise existed. These sessions were delivered as a set, so it was clear that they were time-limited. Activities established with community provision were advertised directly to their members, while library-based delivery was advertised for children in the local area.

In light of the instability associated with project-based funding outlined above, and a changing funding landscape beyond the COVID-19 pandemic, we supported groups to develop the tools needed to continue provision after our input ends. As access to hardware and software required to use Minecraft is contingent on groups securing necessary resources, we created outputs to facilitate engagement with STEM content and suggested alternatives to Minecraft/digital-based activity (e.g. using building blocks, junk modelling, and drawing). We also engaged in regular communication with the liaising organisations to support continued activity and maintain working relationships.

4 ▪ Challenges and mitigating approaches

While we use Minecraft as the existing interest through which to engage children, as an affinity space [Gee, 2018], popular culture can serve as an effective informal learning environment and springboard for engagement [Riper, 2003; Eden, 2025] and many other potential options exist. As such, rather than focusing on the specific groups who have been involved in our clubs or practical factors when using Minecraft (for which we have previously produced a practitioner guide, available at https://www.uwe.ac.uk/research/centres-and-groups/scu/projects/building-to-break-barriers), Table 1 sets out three key challenges that we have identified through reviewing and reflecting on our delivery that could also apply to undertaking science communication activities in unexpected or less traditional settings for science engagement more broadly, and approaches we have used to navigate and overcome these. The resulting synthesis is summarised in Table 1.

4.1 ▪ *Reaching specific groups*

Working with established organisations, relevant to the intended audience, can facilitate delivery in various ways. Such organisations can reach the audience through existing communication channels, both for recruitment and notifying attendees in the event of changes or unforeseen circumstances, which is especially important as change may be difficult to navigate for some audiences (e.g. families with SEN). Furthermore, they are likely to be a familiar and trusted entity for the local community, be set up for the specific needs of the group, and have access to locations that are suitable for the audience if activities are to be delivered in a community setting. It is important to note that some local organisations, which are often volunteer-led, may only be able to assist with or advise on initialisation and should not have a burden of demand placed on them. However, for other organisations, it may be possible to co-deliver activities on a long-term basis for mutual benefit.

4.2 ▪ *Adapting to dynamic circumstances*

Tailoring of activities and delivery for audiences and logistics is standard practice in our projects. For example, our MCs were originally delivered entirely in-person, however, a liaising organisation requested online delivery to facilitate engagement of care-experienced children during their school holiday. In the interests of this target audience, we adapted our delivery to suit their needs — and were then able to draw on learning from this existing MC setup to support the necessitated transition to online delivery for our MC for children with SEN following the onset of COVID-19 lockdowns. Listening to participants and enabling them to express their views and contribute to the co-development of MCs is central to our ethos [Hobbs et al., 2020]. At a smaller scale, other examples of flexibility and adaptability include facilitating attendees participating in quieter areas, taking movement breaks, engaging with complementary activities (e.g. building with physical blocks), and accommodating siblings of active participants to minimise attendance barriers.

4.3 ▪ *Facilitating science engagement outside of formal learning settings*

The delivery of our MCs presents science concepts as themes to build around, rather than making them the main focus of activities. Greater emphasis is placed on communal

Table 1. Challenges, mitigation strategies, and key takeaways from a decade of delivering science engagement through community-based Minecraft Clubs in England, identified during the process outlined in Figure 1.

Challenge	**Context**	**Mitigation strategies**	**Key takeaways**
Reaching specific groups	Unlike outreach delivery through schools, the target audience are not already in a known setting with a readily identifiable contact in a specific education setting. They may not have an existing reason to engage with science-based activities, whereas science is a core subject in the National Curriculum.	Working with established organisations, relevant to the intended audience.	Liaising with specific organisations to determine the best approach offers opportunities to maximise both efficacy of delivery and benefit to local communities.
Adapting to dynamic circumstances	It has been necessary to exercise flexibility and adaptability at various scales, from tailoring each club (or session) to the sometimes conflicting needs of the participants, to rapidly adjusting to unexpected circumstances such as unavailability of spaces, building work, loss of funding and the COVID-19 lockdowns.	Bespoke adaptation facilitates ability to responsively adapt and mitigate for unforeseen challenges. Participants are encouraged to give feedback, anonymously if they prefer.	Taking a flexible approach to delivery enables adaptation to a range of settings and audiences, and provides a foundation for efficiently adapting to varying circumstances, needs, and unforeseen situations. Regularly offering opportunities for feedback and input supports making necessary adjustments.
Facilitating science engagement outside of formal learning settings	Avoiding similarity to school lessons or lectures requires an alternative approach that can be a shift in practice for those delivering activities. Attendees may not be participating due to an interest in science. Participants should be supported to feel that activities are 'for them'.	Science concepts are presented as themes, rather than the activity's primary focus. Participants are encouraged to contribute theme suggestions, which do not have to be overtly science-focused. Main focus is appealing and relevant to attendees. Emphasis is on communal gameplay and having fun. Environment is accepting and low-pressure. Children are supported to creatively explore themes through play. Delivery team comprises scientists from under-represented backgrounds.	Delivering outside of 'traditional' formats requires and supports creativity. No 'right answer' or necessary end goal and accommodation of differing needs and interests supports inclusion and engagement. Representation on delivery team aids relatability for children.

gameplay and having fun, with no 'right answer' or necessary end goal, in an accepting environment without performance-based pressures or expectations to maintain high levels of regulation [Hobbs et al., 2020]. Children are supported to creatively explore the session 'theme' and develop their understanding through related play in an activity they are already interested in. The theme (science topic) provides the framework, while activity in the game is directed by the children, so that they are able to engage in line with their own interests and aspects of the topic they find most appealing, including what they may already know from school and elsewhere. This approach has enabled children to feel that they are 'experts', minimised pressure, and presented science in an alternative format to traditional, formal learning, which some attendees found difficult to engage with [Hobbs, Stevens, Hartley & Hartley, 2019] without emphasising a rigid separation between in- and out-of-school science [Burke & Navas Iannini, 2021]. Introductions are kept deliberately brief, to maximise gameplay time, avoid loss of engagement, and avoid perceived similarities to school lessons; it is important to communicate this ethos to staff, including 'guest speakers' who may deliver one-off sessions related to their fields of expertise. These factors have been key to the success of our MCs and are relevant to informal and non-formal science communication approaches more broadly.

While provision for care-experienced children has necessarily been arranged through external staff with specific expertise, which has been vital when working with this audience, delivery for children facing other access barriers has also benefited from representation on the project team and through working with community group members with lived experience. We also offered opportunities to students from under-represented backgrounds to gain experience through Science Hunters delivery, including at MCs. In terms of communicating science, visibility of people from under-represented groups in STEM is beneficial both for children from those groups, seeing people 'like them' presenting as scientists and delivering activities with STEM embedded, and more widely [e.g. MacDonald, 2014; Gladstone & Cimpian, 2021]. Our experiences of being from under-represented groups also affords insight into challenges and considerations that attendees may need to navigate, including practical issues, improving efficacy when designing and delivering activities. Where this is not the case, it is particularly important to draw on external expertise (including professional, to avoid over-burdening volunteers) to ensure that provision is suitable and tailored for the target audience and avoid inadvertent creation of access barriers or introducing a sense of 'not for me' around science communication activities.

5 ▪ Limitations

Our reflections are naturally limited to the case of our own delivery and are therefore not generalisable [Yin, 2014; Schoch, 2019]. Furthermore, while the MCs described here have targeted children with SEN, care-experienced children, and children in low SES areas, various other groups such as women and girls, people from U.K. minority ethnic groups, disabled people, and those from lower socio-economic backgrounds are under-represented in STEM throughout the engagement, study, employment, retention, and progression pipeline [e.g. Institute of Physics, 2024; Engineering U.K., 2025; WISE, 2024]. As such, we have focused only on extracting the learning outcomes that could apply beyond the specifics of our audiences and use of Minecraft; these may present differently in other contexts and interact with specific springboards, logistics and needs in other ways within the diversity of possibilities for engaging with science through existing interests and activities. These reflections can therefore serve as informative insights to support future practice, the relevance and transferability of which to other activities should be determined in context by practitioners [Lincoln & Guba, 2009; Pammer et al., 2012].

6 ▪ Learning to support future practice

In this practice insight, we have summarised our learning through a decade of experience of undertaking reflective practice to deliver several successful community-based science-themed activities for children centred around an existing interest, focusing on aspects that could apply beyond our own context of using a computer game and working with specific under-represented groups. This has involved accommodating different needs, both between audiences and within groups, working with a range of target audiences and different types of liaising organisations, across in-person and virtual formats and in challenging, rapidly changing pandemic circumstances. We have identified the following broader factors that have been key to success, to inform future project design:

- Liaising with established local organisations to reach, communicate with, and ensure suitability for target audiences.
- Embedding STEM content, rather than making it the primary feature of the activity, and intentionally using informal settings and delivery strategies.
- Making the primary feature something that is relatable and appealing to the target audience — in our case this was Minecraft. In other cases, the 'hook' could be determined in discussion with liaising organisations.
- Including people from representative backgrounds on delivery teams and drawing on the experiences of those with relevant backgrounds in design and delivery approaches.
- Being flexible and adaptable to best meet the needs of participants, seeking and incorporating their input, and having alternative approaches and resources available to facilitate navigation of different needs and circumstances.

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