Near and far: engaging children with place through Minecraft

Minecraft is a computer game without specific narrative or goals and one of the most important of the current generation (Lane and Yi, 2017). It can support learning through enjoyment and play (Ekaputra et al., 2013; Bile, 2022) and attracting children to engage ([AUTHOR] et al., 2019d). Using myriad blocks and modifying environments in alignment with real-world processes, children can 'experience' and explore concepts that they cannot directly investigate (Ekaputra et al., 2013; Nebel et al., 2016; [AUTHOR] et al., 2018a, 2019a; Bile, 2022). There are multiple realms, updates and versions including Minecraft: Education Edition (M:EE) (Kuhn, 2018), with practicalities varying across editions (minecraft.net, Kim et al., 2021). While Minecraft's real-world analogies are representative and can lack refinement, user-generated modifications ('mods') such as the Geological Survey of Sweden's (2020) BetterGeo can improve them.

Minecraft is recognised as ideal for facilitating scientific literacy, active construction of knowledge, opportunities to collaborate and problem-solve, and engagement (e.g. Short, 2012; Kervin et al., 2015; Nebel et al., 2016; Lane and Yi, 2017; [AUTHOR] et al., 2019a) and supporting children with Special Educational Needs to develop skills, explore and socialise (e.g. Petrov, 2014, Nebel et al., 2016; Ringland et al., 2016, [AUTHOR] et al., 2020a). Thus, it can allow enquiry to explore issues (Ferretti, 2013; Roberts, 2017), relating to real-world contexts and with consideration of their future evolution, avoiding a reductionist solely solutions-driven perspective (Bonnett, 2012).

While Minecraft's complexity has increased over time and varying educator experiences with computer games are an acknowledged limitation to its application (Nebel et al., 2016; Kuhn, 2018), its flexibility and students' affinity with it can support senses of ownership and expertise and allow them to direct activity according to their

own skills and interests; less-familiar staff can act as facilitators of child-led endeavours ([AUTHOR] et al., 2019c; Nojiri, 2022). Children are thus able to bring their existing knowledge and experience into the classroom as a powerful, respected learning base (Catling and Martin, 2011; Roberts, 2017) to combine with taught information and gameplay to develop new understanding.

Access to Minecraft and requisite hardware and operating systems is not ubiquitous, and too complex to explore here. However, use in UK schools in increasing; the Welsh Government, for instance, provide M:EE to Welsh schools 'to ignite a passion for creativity, innovation, critical thinking, problem-solving and personal effectiveness through game-based learning' (Hwb, 2022). Its dedicated website (Mojang, 2021a) now contains multiple lesson plans and instructional resources, and the game has been used across an extensive range of educational subjects (Short, 2012; Nebel et al., 2016; Martinez et al., 2022). Here, with acknowledgement that various access issues exist, and examples are extracted only from our own experience and sources with publicly available information, in English, we summarise some approaches taken to using Minecraft to engage children with places.

The concept of place contributes to human meaning-making in both space and time (Quiring, 2015; Millei, 2018). While more research on the influence of digital connectivity on children's sense of place is needed (Martz et al., 2020), computer games have long been used to enhance learning about places and can act as frameworks for their exploration (Quiring, 2015; Wang and Abbas, 2018). Minecraft, as an interactive simulation, is an ideal tool for such engagement (Quiring, 2015). It contains a variety of biomes, and numerous real-world places, with differing complexities and regards to topography, geology, infrastructure and coordinates, have been constructed using it.

Assorted 'real-world places to visit in Minecraft' online lists include Minecraft's own 'Around the world in 80 builds' (Pearson, 2019). The game's open-world nature permits recreation 'from scratch', exploration, and modification of place-linked structures, allowing engagement at various levels. Modifying environments gives opportunities to explore both current places, and potential past and future scenarios. When unexpected events occur within educational simulations, children often change their parameters to explore and improve their understanding, similarly to a scientist, whereas in typical school experiments, they often aim to reproduce expected results without mistake (Wieman, 2008). The experimentation encouraged by Minecraft's lack of specific end-goal and the space it provides to make mistakes have seen it described as an example of Papert's (1980) 'object-to-think-with' (Kuhn, 2018).

Adding relevance to children's experiences and the world around them may increase interest (Murphy and Beggs, 2005) in taught topics; linking gameplay to local places or those covered in formal learning, current affairs or global citizenship (Maude, 2016) contexts may offer such opportunities. Engagement with places in Minecraft occurs across scales including children's own schools, local landforms, known landmarks, palaeoenvironments and archaeological sites (e.g. Iwahashi et al., 2020; Šajben et al., 2020; CCEA, 2022).

The value of students recreating their learning environments in-game, due to the 'natural connection between Minecraft and physical environment', was highlighted by Mojang (2015) in one of its earliest Education Edition posts and M:EE challenges children to 'map our world' (Mojang, 2022a). Many schools, for example in Taiwan (Lee, 2021), Malaysia (Ng, 2017), the UK (BBC, 2020), the USA (Kindelan, 2020) and Australia (Corvo, 2020), have been reconstructed in Minecraft, often involving children in building. Iwahashi et al. (2020) recreated students' school buildings as a base to

explore surrounding geography, geology and palaeoenvironments. A closing rural school in Japan was memorialised for students to 'visit whenever they wanted', covering many academic subjects during collaborative in-game construction and creating an ongoing connection to their school's physical presence (Nojiri, 2022).

Geospatial information can be incorporated into real-world place representations. Ordnance Survey data were used to create a (Guinness World Record-achieving) Minecraft map of Britain in 2013, map Northern Ireland and show British Geology in Minecraft (Ordnance Survey, 2015; British Geological Survey, 2014-2022). Land Cover and Crop Map data form a basis to show the current farming landscape, explore potential future change and visualise new sustainable and resilient farming systems in-game (Centre for Ecology and Hydrology, 2018). O'Leary's (2015) 1:1000 scale recreation of Antarctica was based on British Antarctic Survey data. Various user-generated and commercial online sites offer opportunities to utilise geospatial and Geographical Information System data, providing, for example, high scale Earth maps in Minecraft, conversion between Minecraft and real-world coordinates or custom-mapping of specific places. Mojang partnered with UN-Habitat in 2012 on 'Block by Block', using accurate Minecraft models on every continent 'including in Nigeria, Peru, Mexico, Kosovo and Nepal' for community participation in local urban design (Westerberg and Rana, 2016). While the ultimate impact on planning outcomes of these projects has been questioned, the role they 'have played in engaging disempowered groups such as youth, women, and people with disabilities' is recognised (Bashandy, 2020). In Brazil, de Andrade et al. (2020) engaged children in planning development of their rural community, using a geospatially-accurate Minecraft model. They discuss Minecraft's application, children's values and expression regarding their hometown and other projects using Minecraft in similar ways. In June 2022, Yevhenii Korol's world

of his home city Kyiv was launched to allow 'young people to learn about Ukraine, and explore the culture, history, and architecture of its capital' (Mojang, 2022b); a place in the thoughts of many at that time.

Exploration is not limited to present-day places. Resources developed by Northern Ireland's educational body CCEA invite children to imagine being in Scandinavia 1000 years ago and engage with a functioning Viking society through farming and other endeavours. They then have the in-game opportunity to go on a mission; an archaeological dig on Northern Ireland's Rathlin Island (CCEA, 2022), raided by the Vikings and known for its Viking archaeological finds (Williams, 1990; Mitchell, 2006), adding local context for children. Minecraft thus allows for immersive engagement with both topics and related local history. More explicitly place-based historical explorations cover local to country scales, focusing on, for example, recreating historic parts of Bristol (Local Learning, 2017), a true-to-life archaeological dig in 'mini-Melbourne' (Victoria State Government, 2019), the Tang Dynasty capital city Chang'an (Miller, 2017) and ancient Egypt (Mojang, 2021c). Some M:EE lesson plans encourage exploration of culture of indigenous peoples; for example, in Manitoba in a Minecraft Anishinaabe community, through a project led by the Louis Riel School Division (LRSD) Indigenous Council of Grandmothers and Grandfathers, Indigenous Knowledge Keepers, and LRSD's Indigenous Education staff (Mojang, 2021d) and Piki Studio's Aotearoa-based Ngā Motu world to immerse children in Māori culture (Microsoft New Zealand News Centre, 2019). Many resources create clear links to present-day places, which can also be facilitated through now-lost locations, e.g. Mojang's (2021b) lesson plans on the 79AD Vesuvius eruption encourage students to observe Pompeii and its destruction, consider the implications and mitigation possibilities, and follow links to learn about other real-world volcanoes.

Our UK-based [PROGRAMME NAME] programme involves connecting to specific places ranging from local features ([AUTHOR] et al., 2018b; 2019b) to exploring ecosystems and rainforests ([AUTHOR] et al. 2020b; in prep.) and natural hazards ([AUTHOR] et al, 2018b; 2022) around the world, in Minecraft. A constructive, child-led delivery structure anchors experimentation and construction in Minecraft to discussion-based introductions containing real-world examples and hands-on activities (e.g. [AUTHOR] et al., 2019a), supporting a dialogic approach to topic exploration. Projects mainly operate with schools and at public events (including remotely where appropriate, e.g. during the COVID-19 pandemic). Children from under-represented groups, who may experience disadvantage, including those with Special Educational Needs, from lower socioeconomic backgrounds and children in care are a priority; we work with settings to address access barriers.

Using local features and recognisable landmarks gives direct relevance to children ([AUTHOR] et al., 2018b; [AUTHOR] et al., 2019b), while a place-specific focus to learn about coral reefs produced statistically significant improvement in topic knowledge ([AUTHOR] et al., 2020b). In libraries and primary schools, children have engaged with the Amazon rainforest (and colleagues' research there) as a place both using a pre-constructed world they can explore, and more open-ended, constructive activity in relevant biomes. Evaluation indicated that participation in sessions raised interest in and knowledge of the Amazon rainforest ([AUTHOR] et al., in prep.).

A session inviting children to construct animals adapted to particular biomes in Minecraft, exploring habitats and their locations, produced statistically significant increases in topic awareness in schools ([AUTHOR] et al., 2019a). Real-world links to Minecraft biomes were further utilised in 'home packs' which included a global map of

real-world biomes and related materials such as seeds and wood samples ([AUTHOR] et al., 2018b). Children have also engaged with extra-terrestrial settings, including considering future human lunar habitation. In Minecraft's virtual world, they can think not only about the future, and what actions might be needed to achieve goals (utilising 'mental time travel'; Prabakhar and Hudson, 2014) but design and experiment with possibilities through simulating physical places they cannot travel to.

Multiple topics use specific places for context in exploring environmental hazard and risk ([AUTHOR] et al., 2022). For example, volcanoes and volcanic processes, in a session which has produced significant knowledge increases ([AUTHOR] et al., 2019a), are linked to real-world volcanoes and eruptions. Adaptation in response to current events, such as eruptions in the news, avoids redundancy and 'fossilising' (Young, 2011) over time as children forget or are too young to remember specific events, decreasing their relevancy. Further sessions consider mitigation against eruptions, earthquakes and floods using place-linked examples ([AUTHOR] et al., 2022), also demonstrating the relevance of engineering across disciplines and from different perspectives. Content on flooding has been adapted to link to local examples; similarly local sites can be used when exploring, for example, tunnel construction. Through anchoring game-based exploration to discussion-based topic introductions, places do not have to be directly or exactly replicated in Minecraft in order for children to engage with them through their play, as they can link their game-based experimentation to the real-world context.

The popularity of Minecraft, and processes and environments analogous to the real-world within it, offer opportunities to engage children with both their local settings and faraway places, in the past, present and future from exploration and familiarisation to

modification and reimagining. This can range from 'visiting' local features to imagining space bases, across history and the future; there are almost endless possibilities.

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