Chapter 9

Ideation, playful learning, and making in a Minecraft Virtual Learning Makerspace

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Introduction

The Icelandic educational context of craft extends back to the early days of compulsory education. Art and craft education has an unbroken tradition in Iceland dating back to 1889, when it was introduced under the influence of the Scandinavian Sloyd (Craft) movement (Thorsteinsson & Olafsson, 2009). Sloyd was established as a pedagogical system of manual training that seeks to aid the general development of students through learning craft. Craft became a subject within the curriculum in 1936 until Design and Technology was introduced in 1999. Innovation Education (a new subject area) and Entrepreneurship was also introduced into the national core curriculum as an optional subject for schools (Thorsteinsson & Olafsson, 2009). In 2011, the current national core curriculum was published with a subject division, based on six fundamental pillars: literacy, sustainability, democracy and human rights, equality, health and welfare, and creativity. This curriculum marks a change in the teaching of literacy, as digital literacy and media literacy became a part of the learning process. It spurred new developments, such as makerspaces, that had the potential to link with ICT, design, and craft. The main goal of literacy learning is to invite creative approaches:

> for pupils to become active participants in transforming and rewriting the world by creating their own meaning and responding in a personal and creative manner to what they read with the aid of the media and technology that is available.
>
> (Ministry of Education Science and Culture, 2012)

This open invitation from the curriculum to introduce technology and digital literacy has since been taken up by teachers interested in technology, media, design, and craft. Other factors have been influential, such as the introduction of Fab Labs in Iceland in 2008, now found in eight locations around the country, and the Nordic model of pedagogy prevailing at the preschool level that emphasises the value of play and tends to look at mind and body as a whole (Dýrfjörð et al., 2019). The Fab Labs offered courses to teachers and students in digital making that established a knowledge base and skills that the schools could enhance further.

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The implementation of tablet computers (iPads) in schools was another influential factor that paved the way for 1:1 pedagogy, connected learning, gaming in schools, and digital literacy projects that invited new educational opportunities (Kjartansdóttir & Jakobsdóttir, 2016). These developments encouraged grass root initiatives, such as an all-women tech pioneer team that set about creating a learning community for teachers on making in schools (Kjartansdóttir, Hjartarson & Pétursdóttir, 2020) as well as the formation of teacher community groups (Stefánsson, 2020) and teacher initiatives, exploring making in Minecraft Edu.

Our research project started as a part of the European project 'Makerspaces in the Early Years' (MakEY, 2018). MakEY was an inspiration for researchers and teachers alike, and since its completion several schools in Iceland started installing makerspaces and to develop maker pedagogies, most often with the emphasis on interdisciplinary learning. In our research, we have been interested in exploring children's collaborative making and learning practices in a Minecraft Virtual Learning Makerspace (MVLM) in school education. Minecraft is a popular computer game among young children in Iceland that gives them opportunities to ideate and find solutions through virtual design and crafting, via playful learning. Our leading research question was: How do the affordances of MVLM support students' collaborative making and learning?

Minecraft as a virtual learning makerspace and related research

Makerspace in education, according to Marsh et al. (2017), suggests a model of learning-by-doing in which students can ideate and make artefacts that are of personal and/or collective meaning. It supports social relations and learning practices, often across divisions such as age, gender, or level of conventional education and/or expertise (e.g., Halverson & Sheridan, 2014).

At a general level, a VLE is a computer program that enables online education and that can be utilised both in open and distance learning and in conventional education (Paulsen, 2003). Minecraft can be used for virtual learning as a makerspace. It was designed based on the iconic Lego game idea but located within a virtual world. It is a sandbox game, which allows the gamer to move freely within an endless virtual space (Bebbington & Vellino, 2015) and gain different affective experiences (Abrams, 2017). Minecraft digital making involves both social and digital practices (Dezuanni, 2018), where digital materials, *Minecraft blocks*, are employed. The player can gather, craft, and redeploy these blocks in their making. These digital materials have affordances that provide the player with sensory feedback.

Minecraft has been an object of educational research in Scandinavia and elsewhere (Mørch, Mifsud, & Eie, 2019). It has been utilised by teachers, as a Minecraft Virtual Learning Makerspace (MVLM), in after-school classes and in conventional classes (Dýrfjörð et al., 2019).

Some studies suggest that video games can help develop cognitive skills, such as visual and selective awareness and concentration (Rosas, et al., 2003). Green and

Bavelier's (2003) research showed that students increased their capability to pay attention to a larger quantity of objects and improved their response times, hand–eye coordination, and manual skills while playing. Video games, furthermore, improve spatial skills, and gamers frequently do better on mental rotation tests.

Current research on makerspaces, according to Marsh et al. (2017), indicates that hands-on checking and making across multiple media and digital contents strengthens students' ideation and idea generation as well as critical engagement in disciplinary and transversal learning with numerous digital technologies and media (Hughes, 2017). Furthermore, research indicates that making can assist young students' innovative activities and improvisational problem-solving, inspire students' agency, persistence and self-efficacy, and enhance their ideas and understanding in STEM and elsewhere (Bevan et al., 2014). Marsh et al. (2017) also suggest that making events can establish peer collaboration and transform traditional roles of teachers and students, enabling partakers to develop and draw on each other's relative expertise (Vossoughi & Bevan, 2014).

Affordances in terms of interaction and control

Students used iPads during the research to enter and work inside the MVLM with all its affordances. Gibson (1977) defined affordances as the totality of all perceived action possibilities that are latent in an environment. The iPad has technical affordances, such as a camera and technology to work with multimodal content and in addition a plethora of software applications. These affordances make the tablet an interesting tool for virtual making activities with young students to support the relationship between the students' cognitive and emotional engagement and their learning (Price, Jewitt, & Lanna, 2015; Golland, 2011; Gonyea & Kuh, 2009). The affordances of the technology and software combined influence the ways in which the students interact with the device and the content, offering affordances to communicate and create. The touch screen capabilities enable students to control applications. The affordance of using fingers to control objects on the screen makes the iPad user friendly (Golland, 2011).

Zeltzer (1992) has suggested a framework for the characteristics of a VLE, along with three dimensions that he refers to as autonomy, presence, and interaction. The environment offers the user different interaction techniques, including navigation, selection, manipulation, and system control, to interact with and manipulate the environment. These techniques play a significant role in the users' making. In a VLE, such as Minecraft Edu, the user enters the game via an avatar that has access to tools and a material chest for building. The user's control over their avatar, their personal representation within the VLE, is limited but nonetheless important. The concept of a VLE is linked to the feeling of being in a location and a social setting other than your physical location, and this means that you can control an avatar or another device at a distance. The player's projective identity, embodied in the avatar, becomes noticeable when a player communicates to others on his achievements in the VLE, and this testifies to his emotional involvement (Abrams, 2017).

Digital literacies as a social practice

Rowsell and Pahl, in a recent multimodal literacies research (2020), introduce the concept of living literacies and a living literacies approach to learning. They present the idea of literacies as lived and active, the ideas of 'seeing', 'knowing', and 'making' as offering new theoretical positions on literacy, that encompass both the visual and the oral. According to them the literacy event is

> a living production of meaning that can be written and read, inscribed and interpreted; creativity allows for it to be remade in the moment. Creativity can refer to new meanings or new modes of communication to produce new definitions of what literacy can be.
>
> (p. 118)

Wohlwend (2021) introduces the concept of the literacy playshop to describe a curricular approach through exploratory play and making. It emerged from studies with teachers and describes playshop explorations that are 'learner-led, untidy explorations in play, making, and remaking in makerspaces. Explorations (that) provide creative energy and engaged learning, while mediation comes from responsive provision of materials, tools and technologies in makerspaces with just-in-time-and-just-enough teacher assistance' (p. 242). Wohlwend suggests that a flattening of teacher–student power relations occurring in the playshops enables teachers to reposition themselves, learn from their students and reflect on their pedagogy. In her account she describes four domains in literacy learning: play, storying, collaboration, and production (Figure 9.1). In play, the storylines proliferate, and collaboration brings together players' multiple ideas.

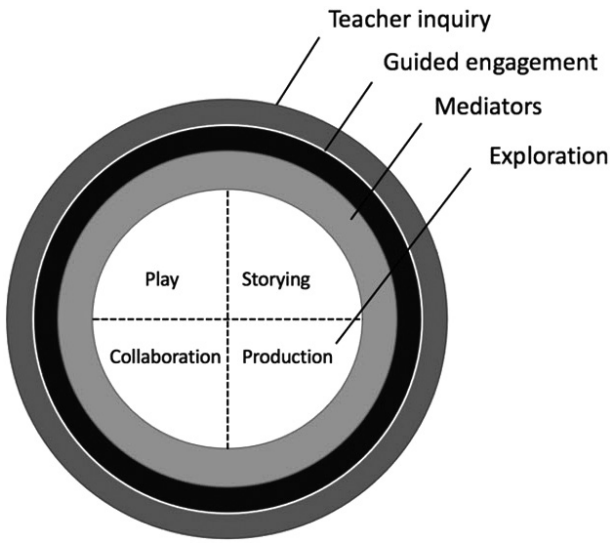

Figure 9.1 Literacy playshop activities.
(adapted from Wohlwend, 2021, p. 249).

Ideation and idea generation

The term ideation originated from Guilford (1950). Thompson (2008) used it to explain the pattern of interactions that arise when an individual generates an idea. Ideation is closely related to idea generation, which is the generation of opportunities, performed in problem-solving and innovation (Smith, 2003).

Minecraft is a societal and experimental learning tool that can easily trigger ideation and idea generation in students as their activities in designing and building are based on their ideation and idea generation abilities. Fullan (2013), argues that we can recognise critical and logical thinking as the ability to solve problems and design, control projects, and make useful decisions utilising a range of tools and resources. Papert (1980) stated that this kind of knowledge and thinking process can support intellectual openings.

Playful learning and making

Kangas (2010) defines creative and playful learning in the context of digital playful learning environments (PLE) as: (1) learning that allows and stimulates learner creativity and knowledge co-creation, (2) learning through designing content in the PLE by using recent technology, and (3) learning through a variety of playful and physical activities in the PLE. She further describes learning as not only related to academic achievements, but also to all actions of learning that consider the whole person as well as the role of cultural tools (Säljö, 2004). Playful learning, according to the social constructivist theories, is also a part of the cultural, social environment, or as Vygotsky would recognise it, a part of a dialogical environment. Kangas (2010) refers to earlier PLE-related studies and summons the following features as being central for creative and playful learning: playfulness, creativity, narration, collaboration, insight, emotions, embodiment, and activity.

Researchers of virtual reality for learning claim that playful learning activities are 'most powerful when they are personally meaningful, experimental, social, and epistemological all at the same time' (Shaffer, Squire, Halverson, & Gee, 2005, p. 105). Ramsden (1992, p. 110) suggests that learning is a 'conception of reality' or how students translate learning for themselves and make their own understanding of knowledge. Playful learning activities in education lie inside a constructivist theory of education. Constructivism is focused on the idea that individuals create their own view of the world based on their understanding of their personal experiences (Gagnon & Dan Collay, 2001). The metaphor Stornaiuolo (2015) employs of culture being a process of hammering a world, where people hammer each other into shape with the cultural tools available to them, creating symbolic meaning together, seems apt when discussing literacy as worldmaking in Minecraft.

Methodology

The research was undertaken in an Icelandic primary school's classroom, in the context of using a MVLM. The participants in the research were ten seven-year-old

students, equally gendered, that volunteered, with their teacher. Two of the students were not able to read and had some learning problems. All the students had used Minecraft before at home and in the teacher's class. The design challenge brief involved a suggestion to ideate and make. The teacher was attracted to the idea of setting up a lesson plan with the researchers using Minecraft as a makerspace platform:

Case study 1: focused on mathematics, based on the national curricula.
Case study 2 and 3: students worked out solutions from a design brief, in Minecraft.

The research study consisted of six 180-minute case study lessons. The lesson sequence was:

1. Introduction and description of design tasks: (1) to design and make a pathway from a mainland to an island and (2) to make a transport vehicle.
2. Homework – sketching an idea of means of transport for travelling in the game world.
3. Individual learners work out solutions in the MVLM and build it.
4. Learners resolve a challenge of moving within the world.
5. Playful learning session, developing further some aspects of design and making.

Various data was collected, and the analysis based on grounded theory, using open coding (Creswell, 1998). Grounded theory consists of a systematic, inductive strategy for collecting and analysing data to construct theoretical frameworks that describe the collected data. This enables the researcher to identify emerging categories in a set of data and to develop initial hypotheses which can be tested iteratively. It focuses on obtaining an abstract analytical schema of a phenomenon related to a particular situation (Creswell, 1998).

The data was treated as follows:

1. Data from diverse sources (Table 9.1) was collected and summarised, and then used to generate categories.
2. Key points in the data were coded with keywords, which were then grouped into emerging conceptual categories. These categories were then discussed, and conclusions drawn.
3. The process was repeated for other data sources.
4. Finally, categories from all data sources were brought together under overall categories.
5. The categories were then used to triangulate the findings and analysed in relation to each other and the literature, and conclusions were drawn.

To fulfil the ethical requirements, the parents, principal, and teacher signed an informed consent form regarding the use of personal information and images in the data. A disclosure detail was sent to the Icelandic data protection authority.

Table 9.1 Data collection methods

Data sources
1. Screen captured videos in the VRM
2. Interviews with the teacher
3. Interviews with individual students
4. Interviews with the students' group about the course and their work
5. Overall videos of the conventional classroom activities
6. Go-Pro videos showing individual students' circumstances and his screen
7. Observations.

Discussing the main research outcomes

The following categories emerged during the analysis as the central themes in response to its aim and the research question:

1. Motivation and playful learning
2. Communication and learning
3. Ideation and idea generation
4. Worldmaking and living literacies.

Motivation and playful learning

According to the interviews with the students and the teacher, the students enjoyed learning, but some had difficulties at school because they were already short of motivation for studying. Playing Minecraft enabled the students to reveal their identity and express their opinions and emotions (Golland, 2011; Abrams, 2017). While working in Minecraft, students experienced their activities as play, not traditional schoolwork – and this motivated them. One of the students expressed: 'I wish we could always play Minecraft at school.' The teacher also argued that the students saw the activities as a game. 'They don't realise that they are learning … where they may have been bored working through a textbook … now they just get into the task instantly and quickly finish the work.' Learning through making seemed to become less of a memorising act and more of an interpretive and creative activity. Many studies indicate that playing is meaningful in the learning environment and that students need to find themselves having fun while learning (Kangas, 2010; Bevan, Petrich, & Wilkinson, 2014). Of course, the novelty factor of a research situation and a design challenge could have impacted (Creswell, 1998).

Communication and learning

Students were given both individual and collaborative tasks and were most often thinking cooperatively when solving learning tasks (Vygotsky, 1978), sharing knowledge during cooperation and collaboration. Their multimodal communication inside the classroom and the MVLM was supporting their individual, cooperative, and collaborative learning (Figure 9.2). The students, according to the teacher, did not talk much while working through their workbooks.

Figure 9.2 Students giving advice, sharing ideas, and reading for illiterate peers in the Minecraft Virtual Learning Makerspace (MVLM).

Our observations showed that inside Minecraft students shared their experiences frequently while working (Wohlwend, 2021). Students who were skilled in Minecraft often took on a specialist role, even if they were not academically strong, enabling their peers to develop and draw on their relative expertise (Vossoughi & Bevan, 2014).

According to the teacher and our observations, the students improved their understanding and recollection of concepts: 'Collaboration affected their work … They take care of each other. They observe each other's work and help each other.' Students with learning problems gained help from more capable peers, e.g. reading in-game signs for peers if they were not capable of reading. This enhanced the students' social relations and learning practices (Halverson & Sheridan, 2014), connecting students with different abilities in negotiations and triggering developments and literacy events in the game (Dezuanni, 2018). Students often offered other students with less abilities compliments when they were getting on with their maker activities. Most likely, this encouraged collaborative action. This discussion between students also seemed important for improving their learning skills and for their social development (Marsh et al., 2017).

Ideation and idea generation

Playfulness was apparent when the students were working informally inside the MVLM in a humorous and teasing manner, it appeared to trigger students' ideation skills and idea generation via synergy. It probably made them confident in using the MVLM and increased their familiarity with each other's intentions. Being physically together and being able to communicate inside the classroom and online at the same time also seemed to assist the students' idea generation and making (Wohlwend, 2021).

Often, student's ideation and making were influenced by their daily lives, mirroring their close environments and cultural contexts. The design challenge anticipated a journey from a mainland to an island and involved the design of measures to achieve it (Figure 9.3). Obviously, their insights from their past experiences and prior knowledge of local topography helped them to make sense of

Figure 9.3 Student designing a vehicle to use in the Minecraft Virtual Learning Makerspace (MVLM).

their new knowledge established via ideation and making (Vygotsky, 1978). While playing, students developed their storying and enhanced their digital literacy in explorations, and relations of everyday life animated literacy events (Rowsell & Pahl, 2020). In accordance with Street's observation (2003), meaning making depends partly on relevant concepts and models that make up their own cultural contexts.

Students' ideation and idea generation were also supported by the MVLM affordances and their media literacy. Students' understanding and use of various tools and digital building materials in the form of building blocks (Figure 9.4) introduced various possibilities. Navigating together around an object, gaining feedback from each other as avatars was also useful. Textures, colours, and animals to spawn also appeared to support the student's ideation (Figure 9.4).

Some of the materials, which were vibrant or interactive, such as fire, streaming water, and lights, encouraged the design of extraordinary objects and buildings and enhanced playful activities. Some students already knew how these affordances were used and could, therefore, focus on their playful learning activities via their ideation and idea generation.

Figure 9.4 Students expressing their emotions in the Minecraft Virtual Learning Makerspace (MVLM).

Figure 9.5 Spawning and playing with animals, polar bears, and horses, triggered the students' emotions and enhanced their idea generation.

Worldmaking and living literacies

In executing the design and problem-solving challenge and the consequential making activities, the embodiment was observed in the relationship between hand and mind coordination and the handling of tools and materials, as well as dexterity in worldmaking activities. This equally depended on their skills in using Minecraft on the iPad and their negotiations during their design and making. In these activities, the sense of touch and its importance in mark making and literacy development was noted (Price, Jewitt, & Lanna, 2015). This was noticeable, when the students started collaborating and storying during their making effort, spinning stories and creating sporadic literacy events at distinct locations within the game world, such as the creation of an animal hospital (Figure 9.5). The storytelling evolved into what we perceive as living literacy events and practices (Rowsell & Pahl, 2020; Street, 2003).

Conclusions

This research examined the use of a MVLM to support students learning in MinecraftEdu. The teacher must employ a variety of instructional methods to facilitate students' playful learning, both in the MVLM and the classroom. Altering the teacher–student power relations enabled the teacher involved in this research to reposition himself and encourage open communication and making, with the aim that students could become active agents and gain power over their learning and creation. The use of MVLM at schools could be considered as a potential bridge between traditional design and craft subjects and creation with digital tools.

Students experienced the lessons as play, but the teacher considered them to be learning situations. The fact that the students were already familiar with the game and skilled in using the iPad made it possible to make full use of its affordances for running lessons, focusing on learning through making. Hands-on activities deepened their understanding and remembering of concepts. It also decreased the novelty factor of running the research in the school context. The learning was characterised by both individual and collaborative tasks, as well as interpretive and

creative activities. It involved much social interaction and negotiations, in open multimodal communication. The negotiations and sharing of knowledge and expertise enabled peer learning, improved social development, and supported students with less abilities.

The research exposed an association in playful learning between the game affordances, ideation, and making. The humorous interaction and synergy in the gameplay were one factor triggering students' ideation and idea generation, that became a driving force of students' learning. Affordances of the game and iPad were another contributing factor and source of inspiration. Digital materials, and tools that were sensed and reacted on, appeared to support students' ideation, and encourage negotiation, design, and making. Students' past experiences and insights from their cultural contexts also played a role and contributed to the making of objects and spatial creations.

The execution of the design and problem-solving challenge depended on the avatar's affordances. This revealed the relationship between hand and mind coordination in the students' handling of tools and digital materials. The reading of affordances and negotiations in collaborative building effort often resulted in storying and creation of literacy events, where students combined their knowledge and skills in making. The results revealed benefits of active, self-directed learning and living literacies in action in the virtual world of Minecraft.

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