Reading and Writing in any domain, whether it is law, rap songs, academic essays, superhero comics, or whatever, are not just ways of decoding print, they are also caught up with ways of doing things, thinking about things, valuing things, and interacting with other people – that is, they are caught up with different sorts of social practices. (Gee 2007, p. 18)

Reading and Writing, for James Gee, is how we engage with any knowledge community; what he calls a semiotic domain (2007). Our level of literacy in a given domain amounts to how well we can read (understand) and write (convey) the knowledge that the domain values. Education is all about teaching the student how to read and write. However, we read and write with much more than just pens and paper. Our literacy covers how we engage and interact within our domain of knowledge.

In the following paper I will explore these ideas of reading and writing within the domain of Minecraft. I will use the educational theory of John Dewey to show how the community of Minecraft creates its own knowledge community, and how its members learn to read and write.

Keywords: Open Literacy; Education; Video Games; Learning; Dewey

Crafting Mines

Minecraft started as the side project of a Swedish game developer in early 2009. Taking inspiration from various other games for its distinctive look and gaming style, Notch (Markus Persson) first posted a very early build of the game on a forum for independent (indie) game developers called The Independent Games Source (TIGSource 2010).

The practice of taking inspiration from other games is not considered plagiarism in the gaming community. For example, the distinctive ‘blocky’ look of Minecraft was inspired by a game called Infiniminer, which had been created by fellow TIGSource member Zach Barth. Notch talks about Minecraft as an ‘Infiniminer clone’ in its early development. This is what makes TIGSource such an interesting place. Ideas are shared freely. If one person has a good idea and shares it with the community, other people are going to take that idea and go in different directions with it. There is an acknowledgement that many of these ideas would not exist if not for the community, and so it is the community, not the individual, that owns the knowledge that is shared and discussed. What individuals do with this knowledge is theirs, but it is only possible because of the community. This shows the stark contrast to the practices in independent creative communities as opposed to more mainstream companies in the games, music, and movie industries.

It was May of 2009 that the first playable version of Minecraft was released to the wider public. Again, Notch handled this differently. In his mind, the game wasn’t finished. He wanted to add more. He initially charged a reduced fee for the game and promised that any future updates would be made freely available to anyone who had bought the game. This style of release has, for better or worse, become a common practice for indie developers. It’s called early access. Games are released as soon as a playable version is made and content such as extra levels, gameplay modes, and items are added in later. This can be a great way of crowd-funding the testing phase of development and generate income from the game straight away.
Minecraft wasn’t the first, it certainly was an early success story for indie developers choosing to release their content in this way.

In keeping to his promise, Notch kept an online blog about his development of Minecraft and asked for feedback from those who had bought the early version of the game. Players would find bugs in the game or have suggestions for updates they would like to see. Much of the additional content that was added to the main game early on was the result of these discussions. This was the beginning of the online community of Minecraft. It was a perfect mix of a developer who was willing to listen to suggestions, and a community of active players who wanted to help grow this new world.

In many ways, while this was always Notch’s project, he gave an amount of control to the community in what the game would become and how it would be played. For example, Notch didn’t ever put an introduction to Minecraft in the game. It is common practice in most video games to include a short introduction to help the player learn the controls and understand the mechanics of the game. This is also where the narrative of the game begins. However, Minecraft has no such introduction. For example, when playing survival mode for the first time you are dropped into the world without so much as a hint of what the controls are or what you are supposed to do. My first time playing I distinctly remember I had just figured out that if I ‘punched’ a tree several times (This is how the game mechanic is described in many forums), the block would break and I would get a block of wood. I looked up at where the tree I ‘punched’ down used to be and noticed the sun was going down. ‘That’s pretty’ I thought, as the sky grew orange, then red, then blue. I was playing around with the wood I’d picked up (you can refine it into wooden planks, and then build a workbench with those. With the work bench you can make much more complex things) and thought I’d gotten a handle of this game when I heard a guttural growling from behind me. I stopped looking at the wood, and realised it was pitch black in the world and I could make out very little of the terrain. What I did end up seeing, for only a moment, was a tall, green monster-looking thing I would later find out was called a creeper. As it ran towards me it flashed white, and then exploded. I was dead. I had failed to survive the first night.

Confused and a little annoyed I went online to see if this weird thing had happened to anyone else. What I found were several YouTube videos titled ‘how to survive your first night in Minecraft’. From these I very quickly found a series of online forums, discussion groups, and websites dedicated to the Minecraft community. From its humble beginnings on Notch’s development blog, the community had turned into a living breathing knowledge community with the virtual world of Minecraft as its hub.

Deweyan Crafting

The community groups that naturally arose around Minecraft in the months and years after its release is a great model of what John Dewey (2005) called a Community of Inquiry. Society, for Dewey, is an ongoing act of communication between individuals. He says, “Society not only continues to exist by transmission, by communication, but it may fairly be said to exist in transmission, in communication” (Dewey 2005, p. 5). What is communicated is the experiences of an individual; a set of values, habits, practices, beliefs, and ideals. Our social structure is made up of our continual transmission of these experiences, and our attempt to understand the transmissions of those around us. A community of inquiry arises when two or more people communicate in a similar way. Human communication, after all, is imperfect. What we wish to convey to the other is complex, and we have no control over how they interpret our communications. But when we share some values, practices, or beliefs with the other, we have some common ground with which to have our conversation. The more common ground we share, the more complex our conversation can be. The job of the community of inquiry is to facilitate complex conversations (sharing of experiences) between two or more people.

For example, the field of philosophy values (among other things) a love of wisdom, scholarly work such as reading and writing, and lengthy discussions on abstract and theoretical topics. The community decides which works are counted as philosophy and which are not (Plato’s Republic is, but the manual for my car is not), how these works are engaged with (read and discussed, not thrown at each other from various distances), and who has the authority to judge them (the opinions of philosophy professors and authors tend to have more weight than a drunk friend or co-worker at the pub). By adhering to these practices, the member of the community of philosophy is able to engage in a far more complex discussion on, for example Plato’s Republic, without having to first explain why The Republic or Plato are important. These practices outline what reading and writing is, in the sense that Gee (2007) describes, in the context of the community of philosophy. Other communities will read and write in different ways.

What is especially interesting about communities of inquiry is that these values, beliefs, and practices are not static, but always changing. By asserting these values, beliefs, and practices, we are saying that they are valuable and worth holding. In writing this paper I am asserting 2 things; first, that I am a
philosopher, and so can add to the discourse in the community of inquiry of philosophers. I prove this membership by adhering to the values, practices, and beliefs common to philosophy. My second assertion is that Minecraft is a topic that can be talked about in the field of philosophy. In order to prove this I need to show some connection between the community of inquiry of philosophy and the community of inquiry of Minecraft. If my first assertion is accepted, my second one holds more weight. Because if I am a philosopher, then asserting that some thing (namely the game Minecraft) has some philosophical value, is easier to accept. If I am not a philosopher, I have less ability to say what is or isn't valued in the community of philosophy.

Therefore, membership in a community of inquiry gives the individual the power to add to and change the value system of that community. It also allows individuals to connect one community of another. However, it also comes with the responsibility to uphold and communicate those values, beliefs, and practices as worthwhile.

Dewey claimed that members of a community were not only brought together from physical proximity to each other such as neighbours, family, church groups, and schools, but from proximity to ideas and values. It is not the case that our only communities of inquiry are those in physical proximity to ourselves. Even in the early 20th century, when Dewey was writing, subscribing to a particular publication or newsletter, or being a member of a political party, was enough to hold membership in a community. However, what he did not anticipate was the effect the internet would have on the scope and possibility of knowledge communities. The ability to connect to like-minded individuals from vastly different social and temporal locations has had an enormous impact on our ability to create communities of inquiry. The network of online communities that exist today is a prime example of these kinds of social groups.

Dewey places education in roughly two different characterisations: the informal education of a community, and the formal education of a school. We are taught social practices and habits informally, he says. In this way we take on the values and beliefs of our community. The young or inexperienced are praised for adhering to the community's values and beliefs and are punished or shunned by going against them.

Once we begin to use symbols to convey vast amounts of information, education needs to become more formal, such as a school. The problem here is that formal education becomes abstracted from the world to the extent that information is no longer situated in the world. Knowledge is not understood by doing, it is understood by memorising. The danger in this kind of formal education is what Paulo Freire (1996) describes as the banking concept of education.

The banking concept of education ‘...involves a narrating Subject (the teacher) and patient, listening Objects (The students)’ (Freire 1996, p. 53). In this method, it is the role of the teacher to convey information, and it is the role of the student to memorise this information. Freire describes this as a tool of oppression. The teacher is set up as the knowing subject; someone who has all the knowledge. This is contrasted by the student, who is set up as ignorant. By maintaining this dichotomy it asserts the students ongoing ignorance, and dependence on the knowing teacher. Knowledge is therefore a gift bestowed upon the ignorant student by the benevolent and knowledgeable teacher.

Narration (with the teacher as narrator) leads the students to memorize mechanically the narrated content. Worse yet, it turns them into ‘containers’, “receptacles” to be “filled” by the teacher. The more completely she fills the receptacles, the better the teacher she is. The more meekly the receptacles permit themselves to be filled, the better students they are. (Freire 1996, pp. 52–53)

This method of education isolates knowledge from the world, turning it into mere facts. It is also an attempt to control what is counted as knowledge and what is not. Without any connection to the information being taught, or any control as to what is considered important, the student is left out of the process of education. Dewey discusses this in his explanation of the difference between training and educative teaching. Training is about securing habits of practice. Being able to dodge a punch in boxing, recite the times tables, or drive a car is all about being able to act without having to think. Teaching, however, is concerned with the process of thinking, Dewey describes this in the following way:

A clew may be found in the fact that the horse does not really share in the social use to which his action is put. Some one else uses the horse to secure a result which is advantageous by making it advantageous to the horse to perform the act – he gets food, etc. But the horse, presumably, does not get any new interest. He remains interested in the food, not in the service he is rendering. He is not a partner in a shared activity. Were he to become a co-partner, he would, in engaging in the conjoint activity, have the same interest in its accomplishment which others have. He would share in their ideas and emotions. (Dewey 2005, p. 11)
Dewey’s great challenge was to create a formal education around the informal structure of a community. In a genuine community of inquiry, information is situated and contextualised so that it is practical, but it is also capable of the level of complexity that is required to understand, and live in, our contemporary society. To do this, Dewey framed subjects like English and Mathematics as communities. The rules of addition and subtraction, for example, became part of the practices and values of the community of mathematics.

Communities of inquiry are like bubbles of knowledge. Each holds knowledge that is useful to that community. Truth in this context is relative. How we explain and describe the world is going to be different depending on what community you are in at the time. Each subject in school is a different community of inquiry for Dewey, and each explains and defines the world differently. But outside of the formal structure of a school, we see communities of inquiry in the wild all the time. Football supporters, unions, interest groups, and gaming communities are just a few examples. Different communities will value different things in different ways. The truths adhered to in the practice of philosophy, for example, are different to those in the practice of mathematics. However, there are similarities; some values are shared by both groups. It is these similarities that allow for communication between different communities. Our society is made up of overlapping and connected communities of inquiry, where different sets of knowledge are used to describe the world. Dewey argues that, in order for us to navigate this subjective conception of knowledge, we ought to be members of multiple communities where we can describe the world in different, but accurate ways as well as understand other people from vastly disparate communities.

Communities of Minecraft

In order to highlight some key features of the community of inquiry, I’m going to look at a case study from the early days of Minecraft.

In 2010 an artist going by the online handle Halkun posted a link to a project he had just completed (see Figure 1). The project was a ‘build’ or creation in Minecraft of a 1:1 scale replica of the USS Enterprise D from Star Trek: The Next Generation (Capitan Piccard, not Kirk). The project was quickly shared amongst several Minecraft communities and Star Trek fan sites for its accuracy and attention to detail. It was a massive project for one person to have completed. Here’s how Halkun did it: He found the original blueprints of the Enterprise online, and layered them in Gimp, which is an open source graphics editor. He resized the plans so that 1 meter = 1 pixel. He then reduced each of the ship decks to a two-colour bitmap image that was exported as a layer. Each of these layers were uploaded into the Minecraft level editor, and the frame for the enterprise was created. The result of this can be seen in Figure 1.

There was a significant discussion, over several forums, as to whether or not Halkun’s wireframe was legitimate – whether or not the community of inquiry would accept this as appropriate practice. He hadn’t laid down each block by hand (he hadn’t placed each block in the game himself), so some in the community thought this might constitute cheating. At the time, Minecraft had no end game state. It wouldn’t have an

![Figure 1: Wireframe of the USS Enterprise D in Minecraft (Halkun 2010).](image-url)
adventure mode with the end goal being to find and kill the Ender Dragon until 2011. In what way, then, could Halkun have been considered cheating?

Some actions in a community are illegitimate. These actions go against the values and beliefs, or act contrary to the habits and practices, of a community. For example, hypotheses in science have to be falsifiable, otherwise they are not scientific hypotheses. I might have a hypothesis that I was Socrates in a past life citing my love of philosophy, beards, and white robes as evidence. But this hypothesis is untestable and unfalsifiable, and so not scientific. If I attempt to write and publish a paper about my past life in a scientific journal, it will get rejected. It is in this way that Halkun’s project was being judged as potentially cheating; was the action he engaged in legitimate practice in the community of inquiry of Minecraft?

What was decided was that Halkun had done something new, and something valuable. He had used several programs to create an amazing structure, and while the skill involved wasn’t in Minecraft per se (it was in creating the images to upload), it became a valuable practice in the Minecraft community nonetheless. New knowledge was created. Several new ways of building emerged from this, and other instances like it in the early days of the community. It was also around this time that modifications to the game (a practice known as modding) become common practice. The potential for action in the Minecraft community expanded greatly to include actions that engaged with the game in unforeseen ways.

For Halkun, he made a public server and asked for help in building in all the decks. On a forum on one of the Minecraft sites, he posted a detailed key as to how to properly build the decks. What blocks to use, how to colour code everything and what the layout of the inside of the ship should look like. A year later, Halkun posted a video online of an almost complete Enterprise. There have since been many projects like this one. Wireframes are shared freely, so that people can engage in different kinds of builds. Once again, this blurs the lines drawn by ideas of conventional intellectual property.

What’s significant about this story is the way in which the community of inquiry around Minecraft works. Halkun posted his initial project on a Penny Arcade forum. Penny arcade is a web comic about two guys who like to play video games. It has nothing directly to do with Minecraft. Halkun was also a member of some of the Minecraft discussion groups, as well as some of the Star Trek forums, where he got the blueprints for the enterprise. Halkun’s project showed the connection between these different communities. By posting this project, he made a value judgement about a particular activity; that making a model like this was valuable, and that interacting with Minecraft in this way was legitimate. Various communities responded positively to this. At various times Halkun, as well as others in this informal community of inquiry, acted as both students and teachers. Unlike Freire’s banking concept, the form of education that is seen here aligns much closer to what Dewey has described. Halkun’s post was the act of a student bringing a project to a teacher for evaluation. This subsequent evaluation allowed new knowledge to be created in the Minecraft community, which situated Halkun in the role of teacher. The fluidity of the roles of teacher and student is a key aspect of Dewey’s model of education. For Dewey, the student is always capable of adding something new to the discourse, making them teachers. The teacher, on the other hand, is always capable of learning something new, making them students (Dewey 2005). Both teacher and student are therefore engaged in a conjoined activity of exploration where both parties are invested in the outcome; much like Notch and his development of Minecraft, and Halkun and his wireframe Enterprise.

The network of forums that Halkun communicated on highlights how communities of inquiry don’t exist in specific locations, even online ones. The community of inquiry only exists because each member holds to that community; their values, their ideals, and their knowledge. In this way, Halkun was operating as a member of these communities by affirming a new set of values. However, we can say a lot more than merely he was making a 1:1 scale version of the Enterprise in Minecraft. The underlying values that were invoked by Halkun and affirmed by the community were about how ideas and intellectual property is shared, how to engage with the world of Minecraft, and what constituted a valuable enterprise in this world.

For Dewey, this is how members of a community of inquiry create and affirm the values and therefore knowledge of that community, as well as how members pass on that knowledge to initiates.

**Crafting calculations**

Let’s look at one more case study. Redstone is a particular mineral that can be found in Minecraft. With it, you can generate a form of energy or power. This allows players to add simple movements to their Minecraft builds. With Redstone you can power minecarts, open and close doors, or turn lights on and off. But this material is far more versatile than that. Redstone functions on a simple binary system. Things can be either getting power or not; they can be either on or off. From these very humble beginnings, Redstone can be used to build objects in the world that function like binary computers.
For example, a logic gate is a device (either physical or digital) that takes one or more binary inputs and produces a single binary output. It functions on the rules of Boolean algebra and is used in programming extensively. A single logic gate can produce one output, sometimes called a bit which can be 1 or 0, yes or no, on or off. Logic gates can be used to create what is called an adder (Properilingsh19 2012) which is a more complex build that is used in simple arithmetic. String several of these adders together and you can represent far more than 1 or 0. Each adder you add to this structure doubles the amount of numbers you can calculate. A single adder can produce an output of 0 or 1. This means we can represent the numbers 0 and 1. Having a second adder means our possible outputs double to 11, 10, 01, or 00. The first number will give us the value of either 0 or 1. the second number will give us the value of 0 or 2, the third number will give us the value of 0 or 4. By making a string of these values (as in the Table 1) we can very quickly start to represent larger numbers.

From here, it wasn’t such a big step for people to start creating a sort of physical binary programming in the Minecraft world. From simple switches and logic gates, players experimented with Redstone to create more and more complex binary machines; physical computers inside a digital world. In short, players built calculators in a game made entirely of blocks.

The computing machines that are being built now in Minecraft have come a very long way. One example (Figure 2) shows an 8-bit quad core computer that functions in much the same way that a desktop computer does. The architect, legomasta99, has several YouTube videos where he goes through the technical specifications of his machine. These videos serve as a starting point for other members of the community to discuss programming, hardware architecture, processing power and efficiency, and much more. New members of this community often post questions such as ‘how do I build something like this?’ or ‘Where do I begin to learn this stuff?’. Other, more experienced members of the community will often respond to these posts with lists of sites, videos, and tutorials for programming languages and other programs that the new members should learn (u/superbloxw 2019).

Dewey framed the practice of education in exactly this manner. New members of a community of inquiry are guided by older members. While the newer members follow their own interests, they are given the tools they need through interaction with other members. Anything new that is learnt is shared, and anything innovative or new is judged by all members (Dewey 2005). The community of inquiry of Minecraft is able to use this system to teach its many things. One of the most complex skills that this community can teach is the ability to create ‘physical’ computers that have a high level of complexity within a virtual world.

Table 1: Binary computing number values.

<table>
<thead>
<tr>
<th>Numbers Represented</th>
<th>Adder 4 (Value 0 or 8)</th>
<th>Adder 3 (Value 0 or 4)</th>
<th>Adder 2 (value 0 or 2)</th>
<th>Adder 1 (value 0 or 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
It is important to mention that in order to present these case studies I had to learn a great deal about programming and physical computing, two things I know very little about. Instead of learning what I needed to know through an institution or a textbook, I have gathered all my knowledge using the Minecraft community. Because of this, my knowledge is probably very patchy, but what I do know is situated by the functionality of this knowledge. I have an idea of binary machines, for example, because I have seen one being built and function. From my experiences, I can confidently say that the community of inquiry of Minecraft is more than capable of sharing complex values, practices, and habits on par with any formal educative community.

Deweyan Communities in the Wild
Dewey’s project in Democracy and Education is to develop a system of education based on the principles of Pragmatism. His focus is on the development of formal education. However, the case of Minecraft highlights the level of complexity an informal community of inquiry is capable of producing. The community of Minecraft has no formal hierarchy, no official homepage, and no manifest of members. It is not run like an organisation, despite the game itself being owned by an organisation. After all, the community of Minecraft is not the game, but the players.

What we can learn from the community of inquiry of Minecraft is the scope and possibility of informal communities, and the vague line between the informal and the formal. Dewey begins his discussion on informal education and moves to the more complex and abstract formal education of the school. In many ways, this is the trajectory of the Minecraft community as well. Not long after Minecraft was released, a series of Mods were built by a group of game developers and teachers called TeacherGaming. These mods made several changes to the core game so that teachers could create different scenarios for students to engage with. By 2016 Minecraft EDU, as it was known by then, had grown into a rich collection of pedagogical tools that teachers could use in complex ways to teach a wide variety of subjects like history, geography, environmental science, chemistry, biology, and programming. Minecraft EDU was subsequently bought by Microsoft and rereleased as Minecraft: Education Edition. The formal community of education that Minecraft: Education Edition now exists in would not have been possible without the informal community.

Concluding Craft
The informal community of Minecraft can teach us many things about how knowledge can be formed, shared, and valued. It is not the case that formal education is the only way in which we learn and teach. Cultural artefacts like video games show us in a multitude of ways how communities of inquiry arise out of a shared interest and willingness to engage in an act of learning. While these naturally occurring communities can inform and even overlap into our institutions of formal education, there is an inherent value in keeping them untethered to a rigid set of standards and practices. Informal communities of education play an important part in our overall literacy.

In researching for this paper, I have come across a multitude of examples where the community of Minecraft has surprised me and challenged my preconceptions of what a gaming community can do. There
are too many to discuss here, but I wanted to share two very recent builds that highlight this. The first build is of a flying bee (u/TheCreatorofTNT 2019). The amazing thing about this bee is that it actually moves across the sky. This is possible because in the latest update to the game a new block was added; the honey block. The honey block is sticky and pulls other blocks along with it when launched with a piston.

The second build is incredible for a different reason. It is a build of Notre-Dame de Paris (u/vesko_8 2019); a to scale version of one of the most famous churches in the world. Aside from the amazing detail found in this build, what is important here is the motivation to build such a monument and the ability Minecraft has as a tool of historical preservation and inquiry.

Competing Interests

This paper was developed in part for the 2019 Open Literacy Symposium thanks to a travel Bursary from Tencent Research. The authors declare they have no competing interests.

References

Gee, J. P. 2007. What Video Games have to Teach Us about Learning and Literacy. New York: Palgrave Macmillan.
Legomasta99. 2018. [Minecraft Computer Engineering] Quad-Core Redstone Computer v5.0 [12k sub special], online video, 30 December, YouTube, 24 October. <https://www.youtube.com/watch?v=Sb00tqH8f5I&t=176s>.