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## Peer Teaching and Learning

### A Case of Two Five-year-olds as Minecraft Creators<sup>1</sup>

Sara Sintonen, Maj-Britt Kentz & Lasse Lipponen

**M**inecraft is a highly interesting form of the digital culture of our time. Oakley (2014) speaks of Minecraft as a sandbox, because just like in a sandbox, Minecraft players create the game world themselves while building content in it (Banks & Potts, 2010). While the Minecraft world could be researched from the perspective of play, we became more interested in looking at it as a pedagogical phenomenon and creative production that encourages peer learning from the perspectives of both learning and teaching. In our research on Minecraft creation by two Finnish five-year-old children, our attention was strongly drawn to their spontaneous pedagogical activities: peer learning and teaching. We were amazed at how two five-year-olds were capable of acting in a self-directed manner, teaching each other, working together to solve rather complex challenges arising from the Minecraft environment, and building a cohesive and intensive session in collaboration.

#### Minecraft as a digital environment for children

Minecraft is often characterized as a (game) world without any rules, storyline, or predefined objectives (Bebbington & Vellino, 2015). Its desktop version (PC/Mac) has five game modes, each of which has clearly defined rules. Creative mode, the freest of the five, allows for endless construction, collection and peaceful living. In contrast, in the Survival, Adventure, Spectator and Hardcore modes, the boundary

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conditions are clearly defined (Koutsouras et al. 2016). Weapons, potions, protective gear, and traps used in different modes also have clear instructions: what kinds and amounts of construction or raw materials are needed, and the order in which the construction and preparation can progress. Following the guidelines also requires precise knowledge of the location of the necessary materials, as well as the courage and skill to acquire them. For example, before you can prepare a healing potion (vs a harming one), you will first need to craft a brewing stand, a cauldron and a glass bottle (Milton, 2014).

Playing Minecraft on a server brings a collaborative multiplayer dimension to the game (PVP, person versus person). Any user can choose to set up a Minecraft server and, as administrator, define the rules on their platform (for example, they might choose to authorize or disable the option for live team playing), which further elicits the players' creativity. The multiplayer genre is closely linked to sharing game sessions and following them on YouTube channels. YouTube offers Minecraft enthusiasts game instructions and solutions for survival, and also new ideas for creating and building their own game culture. The vocabulary used in YouTube's Minecraft videos reflects the fact that Finnish players generally prefer to use English as their interface language.

The transparency and flexibility of Minecraft has prompted players to create complex worlds, amazing works of art, and performances (Duncan, 2011). Minecraft is currently one of the bestselling PC games in the world, making it a point of interest for many researchers from different academic disciplines. Globally, it is also one of the digital brands best known to pre-school and primary-school aged children (Chaudron et al. 2015; Noppari, 2014). In the context of learning, Minecraft and its environment have been studied in terms of the development of teenagers' information literacy (Bebbington & Vellino, 2015), as a learning environment that reflects and supports high school students' creativity in literature studies (Cipollone et al. 2014) and inspires the production of art, develops students' collaborative planning (Wu, 2016), and promotes social learning (Banks & Potts, 2010). These researchers seem to have focused on looking at Minecraft as a tool for achieving a certain learning objective.

## Collaborative activities in digital environments and the basis for peer learning

Many environments of digital culture are community platforms. Bruns (2008), for example, speaks of *produsage*, whereby an open and wide-ranging community of participants is an active producer of content that is continually modifiable and developable. Such environments promote peer learning: Minecraft encourages users to be creative and supportive of each other, and in doing so, support peer learning (Wernholm & Vigmo, 2015).

Peer learning is typically defined as an event in which the learner serves as a teacher to his or her peers and the community works together to solve a problem (Fawcett & Garton, 2005). We approach peer learning through a socio-cultural frame of reference with Vygotskian roots (Greeno, 1997; Säljö, 2001). From this perspective, learning first and foremost entails an involvement in activities by a set community. Knowhow is seen as communal, a practical skill of doing and acting. In participation, knowledge is created from and mediated through the variety of perspectives of the participating actors. People learn to use the tools of thought and action, and especially those of the communities they take part in. In addition to participation, the socio-cultural learning framework emphasizes the importance of tools in human action (Säljö, 2001; Vygotsky, 1978). Peer learning is defined here as learning from others, including the teaching aspect, on the one hand, and communal learning as a mutual, shared process on the other.

In young children, peer learning is often studied from the perspective of what children learn about themselves and their own abilities in relationships with others of their own age, with the peer group acting as a model for thinking and behaviour (Bandura, 1997). In light of this material, peer learning is based on teaching each other. It is manifested as mutual negotiation and the search for a solution born out of the creative process.

## From peer learning to mutual knowledge-building

The focus of this article is an analysis of the shared Minecraft creation activity of two five-year olds from the perspective of peer teaching and learning. Our qualitative data consist of a video recorded session (22:13 minutes), which represents peer learning and teaching, as well

as the players' Minecraft competence and ability to perform sovereign actions in digital environments. Our data show children who are competent in their own digital cultures communicate in a way that can be characterized as an expert interaction, through teaching and learning. The video data were collected in an environment that was natural for both five-year-olds in the study. Both players were in their own homes, using laptops and communicating at the same time via FaceTime on mobile devices (iPads). They themselves had come up with the idea for this technological setting for sharing their game.



**Image 1.** One of the players showing the screen to the other player through FaceTime.

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We will now consider the five-year-olds' digital creation in Minecraft through five episodes. These episodes represent the nature and quality of the intersubjective, shared idea and understanding the players have, and show how they engage in a participatory and collaborative social teaching and learning context.

The game session (22:13 min) is divided into two clear subsets. Most of the first ten minutes (9:26 min) covers the use of the EMC (energy matter currency) generator. The session continues with a focus on building a versatile and powerful tool for Minecraft (the morning star). It is

worth noting that the players, Topi and Mikael, do not see each other playing in real time, except when their communication is mediated via the iPad. In other words, the two create in 'different worlds', and do not play side by side during this session.

During the first part of the session, Topi's primary role is to advise and explain the EMC generator's operating principles and benefits, as the tool is new to Mikael. The two friends' comments are distributed fairly evenly, with Mikael slightly more active (61 comments) in his role as the primary learner than Topi (53). Since the boys are working separately, Topi (for whom the EMC generator is already a familiar tool), has the ability to do other things on his own, like looking after his bee farm. Thus, in addition to explaining the use of the EMC generator and advising, explaining, and justifying his choices, Topi himself has an opportunity to experiment and learn new things.

In this first part of the session, the cooperation between the boys starts easily and naturally. They work on the EMC challenge for ten minutes, but to begin, only one direct question from Mikael and one straight answer from Topi are required. The rest of Topi's EMC responses (15) are explanatory, specifying and justifying, and also include questions guiding Mikael's progress and comments supporting his choices, such as 'Yes', 'So' and 'Okay' (10).

Mikael's role as a learner manifests itself in the discussion in a variety of ways. He explains his actions quite richly from a pedagogical point of view. He asks Topi for clarification six (6) times, expresses his understanding of the instructions/advice (3) and his acceptance of and compliance with the instructions given (7), and slows Topi's pace down once (1). Mikael justifies his solutions and choices relating to the construction phases (8), and explains and shares his achievements (13).

Although Mikael is immersed in his work, he follows (5) what Topi is doing the whole time and comments briefly, for instance saying 'Okay' and 'Yep'. In Mikael's case, our attention turned to his reflective speech, which also acts to guide his own actions when faced with new things (12). The role of learner prompts Mikael (4) to also thank Topi and express his enjoyment: 'Thanks for telling me that, that it's this I mean, it's so cool that I can copy these now...'

The second half of the session also starts very spontaneously. Mikael has just managed to get the EMC generator to work and grasped the principle of ‘duplication’, although complete success still requires some fine tuning, and at the same time the phone rings at Topi’s and he leaves to report this to an adult. Mikael continues fine tuning and Topi returns. Topi begins to persuade Mikael to pursue new challenges, asking ‘You know Morning Star?’.

The second half of the session, therefore, focuses on the construction of the Morning Star. As the tool is new to Topi as well, he starts learning by doing, meaning that he begins to build while explaining the building process at the same time. The work becomes less synchronized, as Mikael was not prepared for the change, and it takes him a while to gather the necessary materials and working space. During the session Topi himself becomes a learner, trying his best to figure out how the morning star can be constructed. The players gather dark matter, duplicate it their own, and take turns counting how many stacks (=64) of red matter the EMC generator has produced.<sup>2</sup> As the gaming session progresses, the vocabulary they use becomes more professional and incorporates more English terms mixed into the Finnish.

Although the setup of the activity changes (both players are now learners), the narration shows that the action is intentional. Morning Star is a common goal that is achieved through peer learning in a nuanced way, and through deeper mutual intersubjectivity. Intersubjectivity requires initiative, listening to the other and understanding perspective, as well as linguistic exchange. According to Kronqvist (2004), these are obligatory conditions for successful collaboration. In the final stage, when the players are close to the target, they are creating the same, new thing in the game almost synchronously. At this point, the negotiations, questions and mutual teaching have turned into talking out loud to themselves (Episode 1). Finally, the players manage to reach their goal:

Topi’s parent: Five minutes. Boys, now, five minutes.

Mikael: Okay, that’s fine.

Topi: Okay.

Mikael: Now, yes, I have mor[e]...I just take a little like this...

Topi: Dark matter, picks, dark, no but... what am I doing...

Mikael: Dark matter, picks [pickaxes] over there. Okay, I put some

of those here, like this, this, this, this, this. Now we do this, like this. Now, yes, now. Now a lot of these come... really... I take only a little of this dark matter...

Topi: Guess what I have?

Mikael: What?

Topi: Morning Star.

Mikael: Yes.

In the second period of the gaming session, Mikael starts acting more independently, and tries different solutions on his own. The players might work on their own for longer periods of time, but when one of them needs help, both are immediately drawn back into the joint action and dialogue (Episode 2):

Topi: I really need to make a chest.

Mikael: Like so, so, so... [mumbles]

Topi: I have an invi... [inventory] full of red matter.

Mikael: Okay. I'll just put some things in there. What...okay, one can't do that. So, can one put any of these in? No, only Silver Ingots... [explains his own testing]

Topi: Okay, now I have also Dark Matter in here, good.

Mikael: I just take some of these...Silver Ingots...not really, let's take some of these...

Topi: Dark Matter

Mikael: So, let's check one of those over here...

Topi: I did...[mumbles]

Mikael: [mumbles] Th-th-this is way, not that way, yes, now!

Topi: Okay!

Mikael: [lifts his arm] Mum, come and see! [mumbles] a couple of stacks of these...

Mikael: Here is my red matter! Then one creates some more...let's take some more

Topi: How much red matter do you have?

Mikael: Wait, see, let me tell you soon, as soon as I've put these emeralds in here...

Mikael: Forty-two.

Peer learning emerges in the material as negotiation and guidance, but also includes commanding the other and reflecting out loud. It is

clearly not simply a discussion as an exchange of ideas; a discussion during a Minecraft gaming session manifests itself as social, shared thinking (Mercer, 1996) that also progresses synchronously at the level of the players' activities. Mercer noted that not all speech helps learning, but found exploratory talk – characterized by collaborative reflection, problem analysis, comparison of explanations and making joint decisions – particularly important for community and peer learning. This feature of peer learning (exploratory talk, shared thinking) are visible in Episode 3:

Topi: The other option is, that you write in there...wait a minute. Write. Wait a minute. Can you write the same thing, the one, how did you get the EM...EMC machine?

Mikael: Hmm...?

Topi: That E N E R G Y.

Mikael: Yes?

Topi: Write it down.

Although in our material peer learning is based primarily in linguistic activities, the gaming sessions also emphasized the importance of sharing the game view (Episode 4). Sharing the representation and looking at it together gives the boys an opportunity to point at this representation. This makes it possible for them to 'see' what the other is thinking. In this way, tools serve primarily to facilitate interaction and participation between people. Minecraft is a framework for the action, but does not limit or determine it:

Mikael: [shows his screen via FaceTime to Topi]

Topi: See there, at the top, a chest.

Mikael: Oh, those?

Topi: That's the place for those, for those chips

Mikael: Oh, you mean those, with that kind of, chest, with a lot of colours, you mean?

Topi: Y-yes

Mikael: Yes, yes, I'll take them both, because I'm not sure which one it is.

Topi: Mmm, oh, are there two of those?

Mikael: Yes.

Topi: ...equal?

Mikael: Yes.

Topi: Okay, then it's right.

The learners have equal decision-making power (because both are building on their own, but with the same content), and mutual respect. This is in line with Slavin's (2014) view of peer learning as being about a common will to succeed, rather than competition. Slavin emphasizes the role of a shared, clearly defined objective in a successful peer learning experience. In his view, the objective and the action have to be sufficiently challenging, with none of the parties acting as a helper to another, but everyone is supposed to learn. The situation must be enjoyable, as peer learning is strongly social and communal in nature. This is illustrated in Episode 5:

Topi: You know morning star?

Mikael: Oh, what?

Topi: You know morning star?

Mikael: Yes, I... [is listening while working]

Topi: Have you ever managed to make one?

Mikael: No, what's morning star? [stops for listening]

Topi: Well, it's like, if you right-click [on the mouse], it will attract a lot of that kind of cobblestone, and will leave the ores in there.

Mikael: Okay, how you do it, I want to know?

Topi: You need to put, wait a minute, I need to check that too. Blah. You need to have a lot of red matter.

Mikael: Okay, I'm already copying them here, it works!

Topi: Okay, let me see.

In the above exchange, one player probes the other for his knowledge of Minecraft's morning star tool. As the dialogue progresses, it is discovered that the asker himself is slightly unsure how to use it. However, the players solve this together. Ogden (2000) brings up an interesting point concerning collaboration and peer learning: making sense together. He argues that, in addition to a common language, the parties need to have an understanding of others and the environment. This includes mutual respect (De Lisi, 2002). Shared Minecraft creating sessions, like the episodes presented here, are possible only when both parties are familiar with each other's — partly unspoken — intentions, goals and beliefs, in addition to a very sophisticated communication system (ibid.,

215). In this case, this includes knowledge of the game's terminology. Interestingly, the players have taught themselves the sophisticated communication system without adult guidance.

## Discussion

Minecraft is an environment where young people can create, play and communicate with others. In this case, two five-year-olds were on their way to doing this, for instance, collaborating as multiplayer in a local setting. They were creating and producing their own digital culture, whereby 'communities entice learning by initiating a give and take dialogue between individuals across all backgrounds and skill levels' (Kuznetsov & Paulos, 2010:7). Our study shows that also these very young children are comfortable in a digital environment, exploiting it in highly diverse and rapidly developing ways. The players' collaboration conveys both insensitivity and sensitivity in cheering, encouraging and helping the other player. As well as skills related to playing Minecraft (e.g. IT skills, English, mathematics), the players learn social skills and how to settle conflicts. They also develop new rules for the game, as a kind of in-game play, expressing their creativity. Game discourse is a dialogue between two amateur experts, whereby ideas, experiences and observations related to other digital cultures are also shared. Further, our own analysis of the players' creative and productive actions shows that digital tools are not an 'addition' to their activity, but rather an integral part of it. These tools mediate player communication and actions.

In this case, the five-year-olds' gaming knowhow and the skills and knowledge associated with the game are a product of participation and playing together, rather than a prerequisite for participation. This is an interesting finding: these five-year-olds are capable of intersubjective digital production and scaffolding. It is particularly remarkable that the two players spontaneously and continuously created new tools for shared action: different concepts and stories related to the action.

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**Sara Sintonen**, Associate Professor, Senior Lecturer, Department Faculty of Educational Sciences, University of Helsinki, Finland, sara.sintonen@helsinki.fi

**Maj-Britt Kentz**, Ph.D. student, School of Educational Sciences and Psychology/Philosophical Faculty, University of Eastern Finland, majbritt.kentz@gmail.com

**Lasse Lipponen**, Professor of Early Childhood Education, Faculty of Educational Sciences, University of Helsinki, Finland, lasse.lipponen@helsinki.fi

Thus, they deliberately sought to change their social practices and their material, instrumental world. At the same time, they moved towards a common understanding of which resources are available, where to find them, and how they are used and reproduced.

## Notes

1. This article has been modified by the writers of the original Finnish version. It will be published in Kasvatus & Aika, 2017, <http://www.kasvatus-ja-aika.fi/site/>
2. Dark matter is an extremely powerful material for buildings in Minecraft that is indestructible. Red matter is an item that can be used to upgrade other items.

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