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Routledge
2022-07-05

Leskinen , J , Kumpulainen , K & Kajamaa , A 2022 , Finnish Teachers' Leadership Narratives in a School's Makerspace . in K Kumpulainen , A Kajamaa , O Erstad , Å Mäkitalo , K Drotner & S Jakobsdóttir (eds) , Nordic Childhoods in the Digital Age: Insights into contemporary research on communication, learning and education . 1 edn , Routledge , London , pp. 117-127 . https://doi.org/10.4324/9781003145257

http://hdl.handle.net/10138/346353
https://doi.org/10.4324/9781003145257

Chapter 11

Finnish teachers' leadership narratives in a school's makerspace

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Introduction

The Finnish core curriculum for K–12 education calls for learning environments that recognise students' personal interests, knowledge and skills, and that enhance students' active participation in self-driven learning across disciplines (FNAE, 2014). During recent years, makerspaces and maker education have attracted educational attention in Finland as a means of responding to the learning requirements of the latest curriculum, including the promotion of students' engagement in science, technology, engineering, arts, and mathematics (STEAM), and learning with various technologies and media (Kumpulainen et al., 2020; Juurola & Wirman, 2019). Makerspaces give students the freedom to make choices in their learning activities (Martin, 2015), including where, how, and with whom to work with, seeking support from the teacher and each other as needed (Kariippanon et al., 2018). Makerspaces can also foster students' collaborative knowledge creation and learning (Kajamaa & Kumpulainen, 2020), agency (Kumpulainen et al., 2019), and transformative agency, which accounts for students' initiative and commitment to transform their activity and its context(s) for personal and/or academic ends (Kajamaa & Kumpulainen, 2019).

Although the Finnish education system has a long tradition in handcrafts and design (Autio et al., 2019), makerspaces and maker education bring new opportunities and tensions to existing school practices, challenging the more established roles of the teacher and students in classroom activities (Martin, 2015). At the same time, research in makerspaces has shown that students need their teachers' support to pursue maker activities and engage in learning (Kajamaa et al., 2019), suggesting that students and teachers need to have the opportunity to take part in decision making, ideate together, and share their expertise (Gumus et al., 2016). Such distributed leadership between students and teachers allows for students to take authority and control over their work (Hairon & Goh, 2015; Leskinen et al., 2021).

Despite these emerging findings, current research falls short in knowledge about the conditions, opportunities, and tensions of leadership in makerspaces. Our chapter responds to this research gap by investigating how Finnish primary school teachers narrated leadership as it related to their own and their students' interactions in a makerspace called the FUSE Studio. We were particularly interested in

understanding how the teachers' narratives resonated with the notion of distributed leadership, involving collaboration between individuals to coordinate their work and decision-making (Gumus et al., 2016; Ho & Ng, 2017). A narrative approach (e.g., Czarniawska, 2004, 2007) was applied in analysing the interviews with eight Finnish primary school teachers working in the school-based makerspace. This approach was deemed fruitful for generating contextually nuanced research knowledge on how the teachers frame their experiences of leadership, and to depict the relationships between different experiences and their relation to broader social context (Wiles et al., 2005).

Distributed leadership in education

Distributed leadership is a widely-used concept in the educational literature (Harris & DeFlaminis, 2016; Spillane & Orlina, 2005). It has been primarily used to examine teachers' decision-making in schools (Gumus et al., 2016). Although the discussion revolving around the concept involves controversy and debate, it continues to be an influential idea within educational practice and new interpretations of distributed leadership continue to enrich theoretical understanding of leadership as a collective phenomenon and the processes of its distribution (Harris & DeFlaminis, 2016). Distributed leadership is commonly defined as being shared, delegated, and dispersed among individuals (Gumus et al., 2016). The concept presupposes that leadership is not simply restricted to individuals in formal leadership roles, but that influence and agency can be widely shared (Harris & DeFlaminis, 2016). Fundamentally, distributed leadership is a social practice constituted in the collective interactions of individuals and their social situation (Ho & Ng, 2017). Central to this conceptualisation of leadership is that it involves collaboration between multiple agents, a particular group, or community to coordinate work and decision-making (Gumus et al., 2016). Distributed leadership is thus an emergent (Gronn, 2000) and a dynamic process (Ho & Ng, 2017).

Although giving responsibility to all actors is central to distributed leadership, distributed leadership does not imply that teachers relinquish all control over decisions to the students (Hairon & Goh, 2015). In this context, Hairon and Goh (2015) refer to bounded empowerment, which fits well with a school context in which teachers have formal authority over the students but in which attempts are made to untangle power relations between students and teachers so that students can take more responsibility for their learning. Trust is also central to distributed leadership – trusting the students with responsibility over their personal work and learning (Hairon & Goh, 2015).

Some previous studies on distributed leadership have focused on agency-structure interplay to investigate the dynamics between the activity of the individuals and the social and material context out of which the leadership practice arises (Gronn, 2000; Spillane & Orlina, 2005). The activities within any structure are viewed as either reproducing or transforming the existing relations between different actors within a particular social setting (Gronn, 2000; see also Harris & DeFlaminis, 2016). Although it has been suggested that makerspaces allow for

leadership to be distributed between teachers and students (Leskinen et al., 2021; Martin, 2015), it is acknowledged that makerspaces do not automatically lead to changed practices in leadership distribution (Mulcahy et al., 2015), and that the teacher's role is still central in this process (Rajala & Kumpulainen, 2017). Furthermore, some research conducted in student-centred learning environments suggests that teachers can find it difficult to promote students taking responsibility and control over their work (Liu et al., 2021). Based on this finding, some central questions seem to arise: What does 'facilitation' and 'relinquishing control' mean for teachers? How do they enact facilitation and relinquish control to students in their daily teaching practices? (Liu et al., 2021).

Departing from earlier studies on distributed leadership, we have strived to enhance the current understanding of the dynamics of distributed leadership, with a special focus on the interactive relationship between the teacher, the students, and the learning environment. We posit that in a makerspace, leadership can be distributed through mutual decision-making, contributing to learning within the community, sharing expertise, and generating new ideas (Gumus et al., 2016). We view the learning environment as something teachers and students do (or encounter), rather than something that is given to them (Mulcahy et al., 2015). We thus posit that the makerspace context does not automatically foster distributed leadership, but its emergence is dependent on the efforts of teachers and students. Overall, this chapter contributes to the existing body of research on distributed leadership as well as research on school-based makerspaces by investigating the dynamics of leadership distribution in a school's makerspace from the teachers' perspective. We applied a narrative approach to carry out this investigation. On this basis, we ask:

How do teachers narrate the dynamics of leadership in a school's makerspace, the
    FUSE Studio?

Methods

Research setting

Our study is situated in a Finnish primary school in the capital area. At the time of the data collection, the school had undergone a curriculum reform, and thus the school's formal classroom learning environments were extended by introducing a new school-based makerspace, the FUSE Studio (Stevens et al., 2016). The school offers FUSE Studio as an elective subject to students in grades four to six (age 10–12). The FUSE Studio provides students with 30 STEAM projects, called 'challenges'. The challenges range from designing a 'dream home' with 3D modelling software to making windmills and solar-powered cars. Some of the challenges are fully digital and in some, students use hands-on materials that are provided to them in separate kits. The students can access the challenges and their instructions through a website.[1] On this website the students find trailer videos of each FUSE challenge and choose the challenge most appealing to them based on these trailers.

The FUSE Studio follows design principles, including student choice in select-ing the challenges to work on as well as who to work with and minimal formal assessment (Stevens & Jona, 2017). The assessment of students' participation and learning does not include grading, but is carried out by using photos, video or other digital artifacts produced by the students. According to the developers (Stevens et al., 2016), the FUSE Studio strives for peer-based learning with an aim to develop the students' relative expertise – that is, expertise relative to each other developed through interest-driven work and peer collaboration. Further, the stu-dents do not have to rely on their teachers' interpretations of the challenge instruc-tions – or interpretations of what the final product will look like – but can have an active role with opportunities and responsibilities to construct meaning and inter-act with peers to broaden interpretations and direction of their work. Thus, it proposes a new role for teachers as facilitators of students' work.

Data overview

The data comprised semi-structured interviews with eight teachers, conducted at the beginning of the 2017 spring semester. The teachers were individually inter-viewed at the school, and at the time of data collection, they had worked in the FUSE Studio for one academic semester. The interview questions addressed the following themes: the teachers' experiences of the FUSE Studio and its design principles; the students participating in the activities in the FUSE Studio; FUSE and pedagogy; school culture and leadership; and the curriculum reform. Although these themes did not specifically address leadership, the teachers reflected on the opportunities and challenges of leadership and its distribution in the makerspace environment. The interviews lasted for 30–45 minutes. Each interview was audio-recorded and transcribed verbatim.[2] The teachers represented diverse teaching backgrounds: four of them were class teachers in grades one to four, two were crafts teachers in grades seven to nine, one was an English language teacher in grades three to nine and one was a biology and geography teacher in grades seven to nine. The teachers' names (pseudonyms), the grade levels they teach in the FUSE Studio, as well as their pri-mary teaching roles in the school are described in Table 11.1.

Table 11.1 Research participants

Name (Pseudonym)	Grade level in FUSE	Primary teaching role
Stiina (F)	4th grade	4th grade class teacher
Kari (M)	4th grade	3rd grade class teacher
Pauli (M)	4th grade	English language teacher, grades 3–9
Anniina (F)	5th grade	1st grade class teacher
Henri (M)	5th grade	Crafts teacher, grades 7–9
Anssi (M)	5th grade	1st grade class teacher
Tero (M)	6th grade	Crafts teacher, grades 7–9
Matias (M)	6th grade	Biology and Geology teacher, grades 7–9

Narrative analysis

Narrative thinking, applied in this study, allows for the interpretation and analysis of human experience, meaning, knowledge, social action, human agency, and the complexity of social elements of human life (Czarniawska, 2004). Narratives are important processual and temporal tools for interpreting and making sense of one's own and other peoples' experiences, actions, and intentions. They construct ways of action, reflect the context in which they are told, and the context itself can be seen as a socially constructed story (Clandinin & Connelly, 2000; Czarniawska, 2007). Different voices are present in narratives, and much knowledge is mediated through them (Czarniawska, 2007). For these reasons, we used a narrative approach, and it has proved to be an appropriate lens through which to analyse leadership (see e.g. Johnson, 2009).

We began the analysis by identifying the teachers' narrative accounts of leadership during the interviews. Central to identifying these accounts was their talk about how the teachers and students were described as taking responsibility and control over the activities in the FUSE Studio (Gumus et al., 2016; Hairon & Goh, 2015). We then categorised the accounts based on whether and how leadership was distributed between the individual actors. This phase of the analysis produced three categories: teacher-led, student-led, and distributed accounts of leadership. Taking a narrative stance, we then continued the analysis by organising the interviewees' accounts of leadership on a temporal trajectory (Czarniawska, 2004), analysing whether they concerned their past experiences, their current experiences, or the imagined future activities in the FUSE Studio (see Clandinin & Connelly, 2000). The placing of the accounts in a temporal structure allowed us to investigate the teachers' experiences as a sequence of connected events. In turn, this enabled us to analyse the relationships between the three narratives of leadership, and to analyse how they related to a broader social context (Wiles et al., 2005).

Results

The results of our study revealed three narrative accounts of leadership in the FUSE Studio, namely: teacher-led, student-led, and distributed accounts of leadership. In the teacher-led narratives of leadership, the teachers took control over structuring and organising the students' work. In the student-led narratives of leadership, participation was based on students pursuing their interests in personally relevant maker projects. In the narratives of distributed leadership, the teachers worked side by side with their students and shared responsibility over making and learning.

Teacher-led narratives of leadership: the teacher as a conductor

Narratives of teacher-led leadership reflected 'traditional' roles of teachers and students in schooling, in which the teacher is responsible for organising the students'

work. A 5th grade teacher, Anssi, had a teacher-led narrative, which included his thoughts about a cultural change happening in schools along with the implementation of new learning environments. He recognised a common goal for more student-led learning. However, he questioned whether that goal could ever be fully reached. This is evidenced by how he reflected on his past experiences as a teacher and how these are present in his daily work in the FUSE Studio:

ANSSI: In school, you will have daily situations in which the teacher has to work as a conductor if there is a new situation or one that has been new – or it can easily become chaotic. We have many devices here and a lot of things that can draw the students' attention in a somewhat wrong direction – you'll let them eat the marshmallows [intended for use in a challenge] and so on.

In his narrative, Anssi reasoned the need for teacher leadership so that the work does not become 'chaotic'. The goal of student leadership is challenged by a need for him to take control over managing the students' attention in a stimulating learning environment.

Like Anssi's narrative, 4th grade teacher Stiina's narrative included reflections about the change happening in schools. Stiina explained how the students bring former teacher-led ways of working into the FUSE Studio:

STIINA: Overall, the culture in teaching has been so that 'teacher, teacher, I don't understand' and then the teacher has always helped, but well – I just have to teach them out of that habit, at least here in the FUSE Studio, because I cannot always help or know how to help, you have to find out for yourself.

This narrative provides evidence of how the students can expect the teacher to take the lead and act as the conductor of their work. However, Stiina described how she saw opportunities to overcome such challenges by using the technological infrastructure of the FUSE Studio concept. She saw the infrastructure as a means to develop her own pedagogy to support students' taking more leadership in the future.

In sum, the narratives of teacher-led leadership highlight how working in a makerspace entails a constant negotiation among the teacher about how much, when, and how responsibility can be relinquished to the student. The narratives show that past experiences of schooling are visible in the FUSE Studio, and it thus takes time for the teachers and students to form new ways of working in a novel, more open environment, in the context of the school.

Student-led narratives of leadership: stepping back and relinquishing control

Narratives of student-led leadership were constructed from the teachers' accounts in which the teachers stepped back and made an effort to enhance their students' engagement in personal projects and granting the students responsibility for their own work. A 4th grade teacher Annika and a 5th grade teacher Henri both

reflected on their pasts as teachers in their narrative accounts of student leadership. They both explained how they had an orientation to facilitating students' projects in their own teaching outside the FUSE Studio. They saw the FUSE Studio as an environment which quite naturally allows them to implement this orientation. In particular, because the students could develop relative expertise, use it in their own projects and guide and teach each other in the FUSE Studio environment, it was seen as enhancing the students' opportunities to take leadership in their work. They both described this as being important for the students' learning.

Although student leadership was foundational, Henri's narrative particularly showed some challenges in the students' engagement in fully personal projects:

HENRI: Yes, well the instructions are very easy and it's easy to do only the different phases of the challenges, you don't have to apply the skills in any way at any stage and if you do as the instructions say … the students might jump over some of the videos and it's shown in the end that this is what it could be and they make exactly that. Or … someone printed that thing and I'm going to print the same. I want to challenge them to think that … you're supposed to learn the skill to be able to produce something of your own. It's so easy to take something that is ready … It takes effort to understand that in order to learn something yourself, you have to put yourself into it, plus you need to modify and apply the skills you develop.

In this passage, Henri recognised an issue in the current ready-made projects by the FUSE Studio developers. Constructing a student-led narrative, he reflects on a personal pedagogical goal (to urge the students to take leadership over their activity and to make decisions that promote their engagement in personally meaningful projects), and thus connects his current experiences of the FUSE Studio to a future that Henri imagines for him and his students. Annika expressed similar challenges: she was also concerned that the students would merely stick to a specific set of ready-made challenges. Her narrative included a future in which this challenge is overcome by expanding the current form of the FUSE Studio:

ANNIKA: The next step would be to get the students to make their own challenges. When they have a skill they've learned in a challenge, they could possibly combine aspects of different challenges and design a project that's completely of their own making, I'd still like to see that happen … like for example if they've learned – I'm thinking which challenges could be like that – well for example if you've designed a [virtual] game and then you'd want to develop it into a board game. You could use the vinyl cutter, sticker printing things or the 3D printer or something. You could use those skills to make that board game … so that it would start living something completely its own. You'd have the tools and the skills, and you could take it to a whole other level.

This passage highlights how the student-led narrative involves a future in the FUSE Studio in which the students would take even more leadership in creating

projects that are completely their own and using their personal skills and strengths in engaging in those projects.

> To summarize, the narratives of student-led leadership are evidence of the moments in which the teacher can step back, relinquish more control to the students, and facilitate their projects in the FUSE Studio. These narratives involve the teachers' current pedagogical actions, but further highlight their future objectives. Thus, the narratives illustrate how the distribution of leadership between the teacher and the students is something that happens over time – it happens to some extent in the FUSE Studio now, but particularly further in the imagined futures expressed in these narratives.

Distributed accounts of leadership: taking the journey together

The narratives of distributed leadership represent the way in which the gap between teacher leadership and student leadership is bridged. A 4th grade teacher, Kari, described how the FUSE Studio provides options for students to exercise leadership, but they – the teachers and the students – are not quite there yet. However, Kari expressed how distributed leadership could promote students' leadership in the future:

KARI: Yes, exactly. And I think that somehow the sharing of knowledge, taking on new roles, the students would take roles and realize that they can also guide others, an atmosphere of expertise or field of expertise in which you share that expertise among all actors, both teachers and students – that would be it.

A 4th grade teacher, Annika's, narrative included similar challenges. It reflected how the distribution of expertise evident in the passage above does not happen naturally in the FUSE Studio, but it is something that the students need to learn as they work:

ANNIKA: For some it's more natural than for others – you find out about things on your own. For many, it's about literacy, watching the videos; it's inevitable here and so many times I have to say 'have you read the instructions', 'have you watched the video? 'Well no', 'well read and watch first and then ask your friend', and so on. Maybe it's there too that if you go on YouTube there are tons of videos that you can watch and develop your skills but that also requires that you realize that okay, I really want to learn this, and I will go into it.

This passage exemplifies how the infrastructure in the FUSE Studio – the technology and the peer network – allows for the students to develop relative expertise and thus take leadership over their work. Yet, the students do not automatically take such leadership, but the teacher plays a pivotal role in overcoming this particular challenge. The infrastructure in the FUSE Studio allows the teacher to

relinquish leadership to the students by, for example, watching video tutorials and asking for peer help.

Overall, the narratives of distributed leadership were evidence of how the design principles of the FUSE Studio, particularly the technological infrastructure, encourage students to use peer resources, and further allow for and prompt shared distribution of leadership in the learning environment. As such, these narratives represent the dimensions of the FUSE Studio, which help overcome some of the challenges of 'past schooling' and move the activities towards the 'imagined future' of the FUSE Studio.

Discussion and conclusions

In our study, we investigated how teachers in a Finnish school described leadership in a school-based makerspace, the FUSE Studio. Makerspaces create teaching and learning arrangements as an alternative to more established educational practices in the school with consequences to the roles and power relationships between teachers and students. Yet, at present there has been little research about the nature of leadership in these novel learning environments. Our narrative analysis revealed how the teachers' narratives reflected teacher-led, student-led, and distributed accounts of leadership. Together the three narratives of leadership evidence how the makerspace context does not automatically foster distributed leadership, but its emergence demands collective efforts from both teachers and students to be willing to change their more established roles into collaborators and facilitators of learning.

Adding to previous research on distributed leadership, our study showed that the teachers considered it possible for everyone who took part in the school's makerspace to be able to exercise leadership (see Gumus et al., 2016). The teachers' narratives were also evidence of their efforts to increase the students' authority and control over their making and learning. Although the teachers' student-led narrative accounts of leadership reported students taking on new roles and acquiring expertise, this leadership potential was not always fully realised in the students' activities. For example, the teachers and students can bring a traditional culture of teacher-led leadership with them to the FUSE Studio. They can also copy and make pre-designed artefacts without hacking or customising them to make the projects personal, as is the aim in the FUSE Studio. However, the teachers' student-led narratives of leadership suggested an imagined future in which the core principles of maker education – student responsibility over personal projects – were met as advocated by maker education (e.g. Martin, 2015). In these narratives, the students were able to take leadership in designing and pursuing their maker projects based on their interests, skills, and passions. Our results also provided accounts of distributed leadership in which the teachers worked side by side with their students and shared responsibility for making and learning. In these narratives we could see a dialogue between the narrative accounts of teacher-led and student-led leadership, which in the teachers' reflections, created a space for the students in which they could take more authority and leadership over their personal work in the makerspace.

However, our study has limitations which require careful consideration. First, in narrative research, interpretations of events can always be otherwise (Clandinin & Connelly, 2000). It needs to be emphasised that our analysis of leadership relies on our own interpretations of the interviews and theoretical understanding of distributed leadership. We also acknowledge that our analysis was restricted to a specific makerspace, the FUSE Studio, within the context of one Finnish primary school. As makerspaces are now increasingly implemented in Finnish schools (Juurola & Wirman, 2019) as a means of promoting students' twenty-first-century knowledge and skills, agency, and collaborative knowledge creation (Kumpulainen et al., 2020), further research is needed to understand the dynamics of leadership in other types of makerspaces. We hence call for more research to understand which pedagogical solutions and practices can support and help sustain the efforts of different forms of leadership among the teachers and students in makerspaces.

Notes

1   The FUSE Studio website can be viewed at: www.fusestudio.net
2   Informed consent was obtained from all research participants. All names used in this chapter are pseudonyms.

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