

Article

Graduating during the COVID-19 Pandemic: Digital Media Practices and Learning Spaces among Pupils Taking Their School-Leaving Exams

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Abstract: The COVID-19 pandemic has profoundly changed educational and qualification experiences among young people. When the pandemic spread in 2020, schools worldwide were required to switch to remote learning. Through a qualitative multi-method, partly mobile, in-situ research approach, we accompanied pupils in the final year of their secondary education as they prepared for and finalized their school-leaving exams to investigate the following questions: What did pupils' socio-material-technological learning spaces look like during this period? How did they adapt their digital media practices to cope with learning remotely? How did their situatedness in these learning spaces influence their learning experiences? Building on existing research in the field of digital and children's geographies as well as learning spaces, through a combined content and narrative analysis, this article situates pupils' learning spaces and experiences of graduating during the pandemic in the context of family relations, socio-material home spaces, polymediated learning environments and the accessibility of outdoor spaces. We debate the wide spectrum of media practices—ranging from indulgence in digital media, to balanced media use, to attempting to withdraw from using digital media—used by pupils to navigate through inextricably entangled socio-material-technological spaces during the pandemic. The further digitization of education prompted by the pandemic must be used in ways that empower pupils to engage in responsible and active use of digital media, thus allowing them to become mature and resilient digital participants in society.

Keywords: remote learning; distance learning; learning spaces; cON/FFlating spaces; COVID-19 pandemic; narratives; mobile instant messaging interviews (MIMIs); qualitative longitudinal multi-method design; young adults; Austria



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1. Introduction

For many children and young people in Western societies, growing up in “protected, controlled and pedagogically designed (indoor) spaces, such as daycare centers, youth centers, schools, sports facilities and playgrounds” [1] (p. 1) was a common and major part of everyday life before the COVID-19 pandemic. This order of space abruptly changed with the closures of educational institutions to prevent the further spread of the virus, which affected 90% of all pupils (1.5 billion) worldwide (temporarily) in 2020 [2]. Educational institutions fulfill a variety of functions in addition to providing education and care: they foster friendships, offer recreational opportunities, and provide access to health-promoting and preventing activities. The pandemic and the associated abrupt school closures have deprived pupils of these supportive structures and placed them into a previously unfamiliar situation of learning remotely in home spaces, which substantially varied, ranging from stressful, conflictive, or cramped environments, to comfortable, caring, or supportive environments [3].

In Austria, in the first nationwide lockdown on 16 March 2020, schools were required to abruptly switch to remote learning. Until early 2022, four more lockdowns throughout

Austria followed, each with different measures and consequences for schooling. In this article, we focus on the phase of the first lockdown, which was gradually eased starting on 14 April 2020 and lifted on 1 May 2020. The transition phase that followed was characterized by diverse modes of distance and hybrid learning models, whose concrete design and implementation were largely left to school directorates to decide. This phase challenged all agents involved: pupils, teachers, and parents [4,5].

This article sheds light on the pupils' period of preparing for, living through, and reflecting on the school-leaving exam (called Matura in Austria, which is comparable to the A-levels in the UK) early in the COVID-19 pandemic. As Rose-Redwood et al. [6] (p. 98) have noted, "one thing that is certain is that we do not have the luxury of waiting until the crisis is over before critically examining its fallout". This article was aimed at following up on this demand by analysing how pupils from different secondary schools (upper cycle) in Tyrol were affected by the pandemic measures in the crucial phase of their school-leaving exams in 2020. These young adults in a qualification period that was notoriously stressful and upsetting even before the pandemic were confronted by the enormous psychological, social, and spatial consequences of the pandemic, and faced unprecedented uncertainties, particularly in the early phase of the pandemic [7,8]. We asked the following questions:

- What did pupils' socio-material-technological learning spaces look like during this period?
- How did they adapt their digital media practices to cope with learning remotely?
- How did their situatedness in these learning spaces influence their learning experiences and success?

Building on the conceptualization of space by digital geographers, the work of children's geographers on the role of digital media in young people's everyday lives, and studies of learning spaces, this article uses the notion of "socio-material-technological spaces" according to Bork-Hüffer et al. [9] (p. 1), called cON/FFlating spaces. This notion enables contextualization of learning spaces and experiences by elucidating the complexities of the entangled social, material and technological everyday spaces in which pupils were situated during the early phases of the pandemic. By drawing on a qualitative, longitudinal data set that was written in pupils' own words and collected in situ during the pandemic, we explored the complexity of socio-material-technological learning experiences and spaces, including both remote learning and home spaces. Thus, this article gives pupils a voice, provides a new and in-depth perspectives and adds a qualitative perspective to the body of mostly quantitative research on the lives of pupils during the COVID-19 pandemic.

2. Theoretical Approach and Literature Review

2.1. Digital Media Practices and cON/FFlating Learning Spaces

In this section, we explain our conceptualization of entangled socio-material-technological learning spaces, so-called cON/FFlating learning spaces, which provides a foundation for understanding the specific perspective through which we approach our analysis of young people's situatedness in complex learning spaces in the pandemic. We develop our argument by combining insights from writings on learning spaces, children's and young people's geographies, and digital geographies.

Understanding learning spaces as spaces in which learning occurs [10] implies a relational conception of space. Space is thus not a passive container that determines the interactions within it [11], but is constituted by relations and simultaneously constitutes relations [12]. As a result of its relationality, space is not static, but is continually changing, processual and (re-)produced in everyday practices [13]. According to our conception, relationality is not limited to people's social relations, but includes their engagement with materialities and technologies. For example, this concept includes the relationalities of books, learning materials [14], tables, chairs, and (mobile or stationary) hardware in educational facilities or home learning spaces. According to Beckers et al. [15], certain designs of learning and educational spaces significantly contribute to enhancing or detracting from educational practices. The physical presence or absence of others also influences individual learning practices [14]. Thus, learning can be produced through "physical flows of bodies

and objects” [16] (p. 64). Furthermore, Card and Thomas [10] have noted that learning is not restricted solely to the relationality in formally designated places of instruction. Through the mobility of learners, teachers, materialities and, as demonstrated herein, technologies, learning spans various places where learners engage. Here, an analytical differentiation of educational and learning spaces [17] becomes relevant: educational spaces are provided by educational organizations or used by educational stakeholders to facilitate the learning of others. In contrast, learning spaces are created through learners’ practices [10], which we believe must be conceptualized as being embedded in various social, material, and technological spaces. Thus, learning creates its own place as it occurs [10]. We argue that to understand the spatial implications of learning overall, particularly in the context of remote learning, we must be open to thinking about and acknowledging the relationalities and complexities of all spaces in which learners are involved.

Conceptualizations of learning spaces, until recently, were often characterized by a focus on the relationalities of people and materialities in (non-digital) educational spaces such as kindergartens, schools, or university buildings [18–20]. Although the role of information and communication technologies in learning is increasingly acknowledged, the simultaneity and complexity of pupils’ engagement in entangled socio-material and techno-social educational and learning spaces have been less often conceptually examined. Such techno-social spaces include digital educational spaces established, for example, through learning software provided by educational institutions. Additionally, they encompass not only learners’ own use of various digital media for learning, but also social and leisure purposes beyond learning.

Of great relevance to the focus of this article are children and young people geographers’ studies of digital media use. For young people, digital media are a “deeply ingrained” [21] (p. 86) element of their daily lives and practices, and the digital and offline spheres are an inherently entangled experience, thus making the distinction between digital and offline spaces an “artificial frontier” [22] (p. 1450). Notably, mobile media devices have become young people’s constant “companion[s]”, thereby assuming an “active and entangled roles in the emerging composition, rhythms, constraints, and orders of online social interaction” [23] (p. 170). Bencsik et al. [24] (p. 1673) have indicated that even before the COVID-19 pandemic, young adults used mobile applications from the moment of waking up to the alarm function on their smartphones—these devices are the first thing they touch in the morning and the last thing they touch before going to bed. Young people use a variety of digital media for various educational, social, and emotional purposes [9]. As Madianou and Miller [25] (p. 170) have argued, with their concept of polymedia, each individual medium is used not as a discrete technology but as part of “an emerging environment of communicative opportunities that functions as an ‘integrated structure’ within which each individual medium is defined in relational terms in the context of all other media”. Thus, we must add the relationality of media as an additional component of the relationalities of people and materialities in the context of learning spaces.

Because entering a digital space requires being embedded in a material space [26], online and offline spaces can never be considered separately; practices in digital space are shaped by the socio-material spaces in which people are embedded and vice versa [27]. In this article, we extend these propositions with the use of the cON/FFlating (This neologism is aimed at grasping the inseparable conflation of the ONline spaces and OFFline spaces within one word: cON/FFlating spaces) spaces concept, which we transfer to the context of learning spaces in the pandemic. After being first proposed by Bork-Hüffer and Yeoh [28], the core of the concept was further developed by Bork-Hüffer et al. [9,29]. This concept advances Doreen Massey’s relational conceptualization of space with Karen Barad’s [30] proposition of a radical relationality, developed as part of her theory of entanglements, and connects it with digital geographers’ studies on the roles of data, codes, and algorithms in producing space [9]. To Barad [30], separating people, materialities, and technologies into discrete, separable entities is impossible; instead, they must always be regarded as part of their relationality, as emerging “through and as part of their entangled intra-relating” [30]

(p. ix). Among intra-acting (and not interacting) highlights, the radical relationality of space must be considered, instead of focusing on single agents, isolated practices, materialities, or only the workings of codes or algorithms. These aspects must be regarded as always already entangled, together creating socio-material-technological spaces (cf. [9]).

2.2. The COVID-19 Pandemic and Remote Learning

Most pupils worldwide have been greatly affected by the often abrupt implementation of so-called “non-pharmaceutical measures” (partial or full school closures, various types of remote learning, or complete cut-off from education) to contain the spread of COVID-19, and their immediate and medium-term consequences [7,31,32]. For most pupils, these measures resulted in a switch from education in socio-material educational spaces to various types of remote learning in home learning spaces. According to Greener [33] (p. 2), “[r]emote learning, a phrase regularly used in schools and universities in their 2020–2021 pandemic guidance, simply means learning which happens when the learner and teacher are not in the same place, and possibly not active at the same time”. Remote learning can include synchronous and asynchronous learning formats [33]. With the abrupt school closures, Beaunoyer et al. [34] (p. 2) have argued that the use of (digital) technologies changed “from an amenity to a necessity” [34] (p. 1), which lacked alternatives and was unprecedented. However, a large variety of remote learning modalities have been applied worldwide. Beyond high-tech-modalities, such as virtual classrooms, video conferences, e-books, e-mail, and social media applications, low-tech-modalities were used, such as traditional media, e.g., radio and television, and no-tech modalities, such as take-home-packages with books and copies, as well as home visits [2].

Helm et al. [35] have found that the quality of learning and teaching during remote learning is largely dependent on the performance of individual teachers, because a school-wide conceptualization of distance education was often lacking, due to the suddenness of the school closures. Jaekel et al. [36] have suggested that interactive student-teacher and student-student connectedness is most important for instructional quality and student learning in remote learning. Online group work can create an interactive social group context, which is otherwise compromised by social distancing. Social networking sites (SNSs) have been found to be effective for sustainable online education practices during the pandemic [37]. Sabol [38] has described the appropriate use of SNSs such as bitmoji avatars, Facebook pages, Group Me groups, and YouTube videos to support online art lessons in the pandemic. According to Schildkamp et al. [39], the pandemic-associated restructuring of the entire education system and the innovative use of technology led to the development of new skills and competencies among all agents. However, many studies have suggested that asynchronous and non-interactive modalities dominated, particularly during the early pandemic [40]. Consequentially, pupils were required to manage their educational activities on their own, in isolation at home.

Beyond differences in the implementation and effectiveness of distance education, pupils’ everyday learning spaces, social practices, and well-being have been significantly altered in the pandemic. Numerous studies have emphasized how the uncertainties associated with the pandemic, school closures, social distancing, and isolation have negatively affected young people’s mental health [41,42]. Authors have indicated differing effects of young people’s social media use in this regard. On the one hand, Greenhow and Chapman [43] (p. 341) have noted that, “[i]n a public health crisis [. . .], social media offer respite from being alone”, and Gupta et al. [44] (p. 199) have even referred to them as a “saviour”. Peil [45] (p. 53) has observed how such media communication for social purposes was intensified on a “temporal, content-associated, situational and specific level”. On the other hand, the increase in digital media use has been argued to contribute “significantly to the increase in digital addiction among youth” [44] (p. 199) and to potentially be associated with an increase in opportunities for young adults to experience exploitation. The overall increase in violence against children and youth has been referred to as the “hidden crisis of the COVID-19 pandemic” [46] (p. 1).

Furthermore, Reuschke and Felstead [47] have indicated that the ability to work from home (and, we would add, maintain educational activities) is unevenly distributed socially and spatially. Many individuals must perform home-based learning in environments where suitable space is lacking [47] (p. 211). According to Ravens-Sieberer et al. [48], spatial confinement and a lack of options to escape during isolation can lead to more stress and aggression within families, and also increase the risk of domestic violence and child protection-associated incidents (e.g., Section 4.1.).

3. Methods: Data Collection during a Pandemic

The data for this article were collected as part of the COV-IDENTITIES project, which examines changes in young adults' everyday socio-material-technological spaces and practices (including educational practices, work, contacts, and leisure) through a longitudinal qualitative multi-method design over the course of the COVID-19 pandemic. The data collection was adapted both to the specific requirements of the pandemic and to the ethical requirements to meet the combined demands of research in vulnerable groups, in hard-to-reach contexts in the complex processes of experiences, practices, and identity negotiations in cON/FFlating spaces.

Accordingly, two methods were chosen that were applied under the conditions of social distancing, i.e., entirely online: written narratives and mobile instant messaging interviews (MIMIs) [49,50]. Prior longitudinal studies have usually performed retrospective analyses. In contrast, we sought to take advantage of the high relevance of mobile connectivity in young people's lives to overcome this methodological limitation and repeatedly accompany participants during life situations that have been greatly changed by the pandemic.

In this article, we concentrate on one sample of the COV-IDENTITIES data that was collected in school pupils. The sample comprised high school pupils who lived in the city of Innsbruck/Austria or the immediate surrounding area, and attended predominantly two different school types: an academic secondary school (upper cycle) or a college for higher vocational education. The participants were particularly affected by the extensive pandemic-associated changes because they were taking their school-leaving exams (Matura) at the end of May 2020. Throughout Austria, a three-week temporary preparation period occurred for each final-year pupil in local schools, but the remaining preparations were required to be conducted independently online and in isolation.

The pupils were at least 18 years of age. Data collection 1 (DC1, 1–7 April 2020) of the longitudinal study was conducted during the first lockdown and quarantine measures. During this period, people were allowed to leave their places of residence only to meet the basic needs of daily life, and schools were closed. Data Collection 2 (DC2, 2–14 June 2020) was conducted when most measures of the first lockdown had been lifted. A total of 14 high school pupils participated in DC1, and one dropped out in DC2. Ethical approval was obtained from the "Board for Ethical Issues" of the University of Innsbruck and the Directorate of Education of Tyrol. Participants were asked to provide consent to participate in the study and to the academic use and publication of the data. Data were translated from German to English.

3.1. Method I: Written Narratives

Written narratives are a qualitative method suitable for exploring individual experiences with, and reflections on, complex processes of change [51]. Participants received a written request in each round of the collection with stimulating questions. They were asked to write a narrative, save it and return the file directly to us. Narratives allow participants to express their own voice through subjective descriptions and interpretations of their individual experiences and feelings [52,53]. They allow participants sufficient time to reflect, structure, construct and revise thoughts and statements [54]. They retain "the representation of the life story in the words of the person telling the story" [52] (p. 2).

3.2. Method II: Mobile Instant Messaging Interviews

The MIMIs occurred between the researchers and the participants in the form of one-on-one digital conversations at regular intervals (every 2 h) via the WhatsApp mobile messenger app. Participants were interviewed individually regarding their current practices and the socio-material-technological spaces in which they were situated. According to Kaufmann and Peil [50], MIMIs are suitable for studying phenomena that are otherwise not observable in real-time, specifically in young adults and vulnerable groups. Furthermore, they allow the research design to remain flexible both spatially and temporally, thus meeting an important prerequisite for the study of cON/FFlating spaces in longitudinal studies [55].

3.3. Combined and Sequential Data Analysis: Content and Narrative Analyses

The collected material, which included texts, photos, videos, GIFs, emojis, and screenshots, was immediately available in digital form and ready for analysis. Only voice messages required transcription. To make full use of the rich qualitative material of our study, we sequentially combined two analysis strategies: content analysis in the first step and narrative analysis in the second step.

Content analysis is a widely used analysis strategy for data produced through both methods [56]. Because our goal was to investigate the strongly altered subjective life situations of young adults under the unfamiliar conditions of the pandemic, we applied inductive category development [57,58]. This procedure allowed us to aggregate the breadth of different experiences with remote learning and the Matura preparation phase across individual cases (e.g., Section 4.1). According to the overview of cases gained through content analysis, we selected three exemplary cases for narrative analysis (e.g., Section 4.2). We used narrative analysis according to Kuper and Mustanski [59] (p. 505) as a “within-person approach” to examine the complexities of the everyday socio-material-technological spaces in which individual participants were situated. In line with the requirements for narrative analysis, we additionally situated participants’ individual stories within a larger socio-political context [60], the measures during the first lockdown, and the overall organization of distance education. For all data analysis, MaxQDA software was used, which allows for the inclusion of various visual and textual data formats within one analysis software tool.

4. Results

This section presents results from the narratives and MIMIs on how the participants in our study experienced the preparation phase for the school-leaving exam and remote learning during the first lockdown in Austria and its gradual relaxation in 2020. This study was particularly aimed at contextualizing the complexities of cON/FFlating learning spaces in which pupils were situated during the early COVID-19 pandemic. We first describe results from the content analysis, which revealed how our study participants perceived the differences in the organization of remote learning by the schools, in work assignments, and in teacher-student interactions (Section 4.1). According to the results of the narrative analysis, we then discuss insights into the complexities of cON/FFlating learning spaces through the stories of individual participants (Section 4.2).

4.1. Pupils’ Experiences with Remote Learning and Preparing from a Distance for the School-Leaving Exams during the First Lockdown

Remote learning and preparation for the Matura, which was only several weeks away in DC1, were experienced and described very differently by the participants in our study. A variety of structural reasons account for these differences, according to our findings. These reasons relate to major differences in the schools’ organization of remote learning, the types and varieties of software programs used, the workload and learning tasks required for students, methods, and quality of teacher-student interaction, and the specific remote learning methods applied and/or the lack of suitable methods. Consequently, pupils

perceived that their learning outcomes largely depended on their potential to self-organize and motivate themselves to learn: those who faced difficulties in learning under regular conditions were further left behind.

One reason accounting for the differences in remote learning experiences is the relatively loose recommendations provided to schools in Austria, which lacked concrete specifications regarding how schools and teachers should conduct teaching and distance learning. Consequently, schools used very different organizational frameworks. Furthermore, the narratives and MIMIs show that during the first lockdown, schools and individual teachers experimented with a variety of software programs to deliver instruction online. As a result of the lack of a unitary e-learning platform, as noted in a critique by 19-year-old Maria, the “tasks come through many different channels” (narrative, DC1). The young adults in our study felt that they were expected to be able to navigate through and switch between the different software programs used with ease, whereas many in fact found this process difficult. In addition to the sheer number of programs used (in parallel), the lack of accessibility and availability of computers and adequate Internet connectivity to support multiple household members’ work and education were described as problems. The most widely used method of teaching described in the narratives and documented through snapshots in the MIMIs (Figures 1 and 2) was the distribution of task sheets via email or social media platforms from individual teachers to students, often with additional textual or video material attached or links to such material included. The snapshots of the task sheets that we received revealed large differences in their expected workload, time periods covered, and structure.

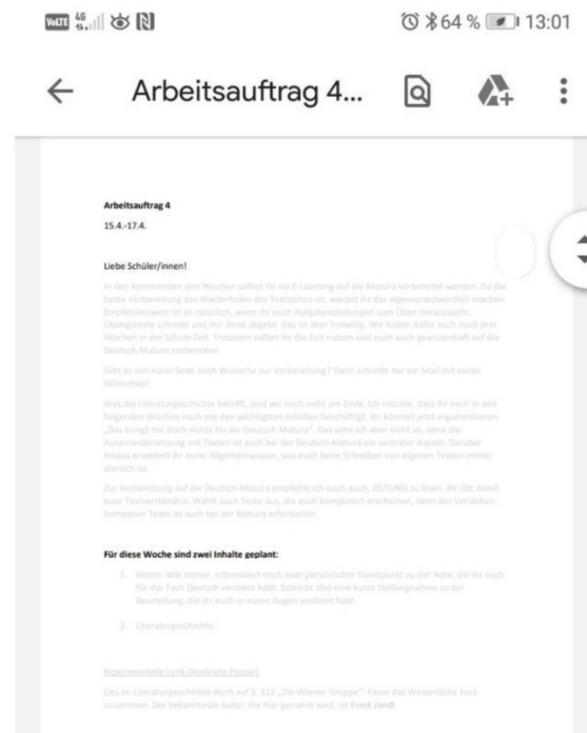


Figure 1. Snapshot of a task sheet taken by Sina during MIMI in DC1.

Figures 1 and 2 (both blurred for copyright reasons) show examples of task sheets that our study participants received. The task sheet in Figure 2 asks pupils to read a text and watch related learning videos, all of which were provided, on the topic of environmental engineering for a workload of two teaching units. The task sheet in Figure 1 combines loose and muddled advice for self-organized preparation for the Matura in the subject of German for the subsequent three weeks. It recommends that pupils revisit past learning material, search independently for learning tasks and texts, write their own texts for training, and

submit them to the teacher. Moreover, it gives students general advice to engage with the most important content from the past year and to read newspapers. Additionally, it asks pupils to submit a written statement regarding the grade that they expect to receive for their performance that year, and provides one concrete reading and writing task for the same week.

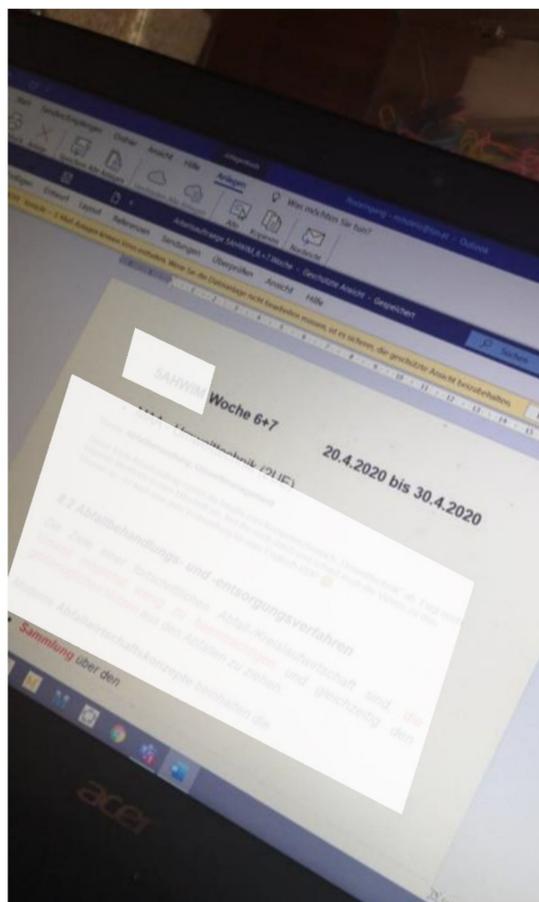


Figure 2. Snapshot of a task sheet taken by Raphael during MIMI in DC1.

Many of the participants in our study reported feeling much more stressed during the first lockdown, as a consequence of having too many learning tasks and a workload that they perceived as too high. Some complained about (online) schoolwork encroaching on their free time and weekends, and suffering from the strain of remote learning. They concluded that teachers gave more assignments than they had given during education before the pandemic. Some felt that teachers were trying to catch up on content that they had previously not conveyed in regular classes, as described by Maria:

“For me the change to distance learning was very difficult. [. . .] But when the teachers, who usually hardly go through any material, think that they have to give the pupils something to do, and since every teacher does that, it is very stressful. [. . .] In addition, most teachers take advantage of the situation to quickly go through all the material they didn't get through before”. (narrative, DC1)

Feelings of stress from the additional perceived workload were reinforced by the lack of opportunities to interact with teachers and fellow students, and the resulting feelings of being isolated and left alone with learning tasks. Pupils missed the opportunity to discuss exciting topics in-depth, or to clarify difficult tasks and ask follow-up questions. Janni (narrative, DC1), for example, reported that he and his classmates found writing a so-called “pre-scientific paper” at a College for Higher Vocational Education particularly

difficult without regular face-to-face contact with the responsible teachers. This paper, which was intended to encompass 180 h of individual work and to showcase pupils' subject matter expertise as they pursued specialized training, had also been required before the pandemic; however, the major difference was that the paper was previously written in close cooperation with the supervising teachers at the school.

Pupils felt that they were just working through the exercises without receiving insightful and appropriate feedback from teachers. As Merle, a 19-year-old pupil, noted, in cases in which direct online meetings and exchange with the teachers were possible, pupils felt that these interactions were less valuable than face-to-face conversations:

"certain meetings via an online platform [are] nowhere near as effective as meeting in the same room, and it seems to me that absolutely nothing is said in those meetings, and you're going around in circles rather than really getting anything done". (narrative, DC1)

However, another group of pupils indicated that they perceived the workload to be much reduced. Hence, they felt that the pandemic gave them an advantage, because they had more time to prepare for the Matura. The diversity of teaching methods combined with the lack of the daily structure of a normal school day as of teacher-student interaction required pupils to have much higher levels of self-organization and intrinsic motivation. Large differences were observed regarding students' ability to cope with these demands. Some participants coped well, and appreciated the opportunity to learn independently and construct their own daily routines. Oskar for example, writes:

"There are actually no big challenges; the daily routine has only shifted from school to home". (narrative, DC1)

In addition, Sina, who describes herself as a very good pupil, explains her current situation as follows:

"After all, we have been working a lot with laptops for almost 3 years now, and in these months, we would only be preparing for the upcoming Matura anyway. Rather the opposite—I find the current situation rather takes the pressure off, as I have time to focus on the things I'm still struggling with". (narrative, DC1)

In contrast, pupils who reported that they already had difficulty in learning under normal circumstances generally found remote learning to be more stressful. Among these was Levin, a 19-year-old pupil, who was facing additional pressure because he needed to raise his grades in the weeks leading to the exams as a prerequisite for being allowed to sit for the Matura at all. He found improving his grades during remote learning difficult.

Students' not being supervised and in a social class setting resulted in less social control and greater difficulty in concentrating among some pupils. Some participants reported becoming distracted by other leisure and social activities, such as watching television or continually interacting digitally with friends, or gaming online, as we elaborate upon in further depth in Section 4.2. Overall, our results indicate that pupils who were already struggling with learning under regular school conditions were left behind, as were pupils who had difficulty with self-organization for various reasons. For them, the isolated remote learning and the required readiness to learn independently posed a large challenge. As further elaborated upon below, the material and social conditions of home spaces, strategies of (poly-)media use, and the accessibility of outdoor spaces during the lockdown influenced this process.

4.2. Situating Experiences with Remote Learning in Individual cON/FFlating Spaces

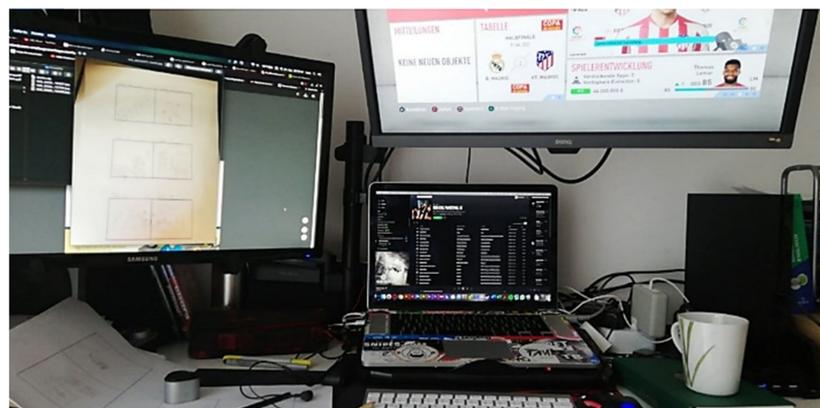
This subsection provides insights into the complexities of pupils' cON/FFlating learning spaces according to the results of the narrative analysis. The stories of three participants are provided as examples to reflect on two dimensions. The first dimension is pupils' digital media practices in the pandemic. Each case reflects pupils' reflexive strategies of engaging with digital media on a spectrum ranging from *diving into the digital* (Mike: Section 4.2.1), to

striving for balanced digital media use (Louisa: Section 4.2.2), to minimizing its use to the greatest extent possible (Aurelia: Section 4.2.3).

The second dimension is pupils' situatedness in complex cON/FFlating learning spaces. Each of the three stories thereby reveals different aspects of cON/FFlating learning spaces in the pandemic: *polymedia environments* (Mike: Section 4.2.1); *family relations and socio-material home spaces* (Louisa: Section 4.2.2); and their *relations to spaces outside their homes through outdoor activities* (Aurelia: Section 4.2.3). After introducing the individual stories, we scale up each case and reflect on its relation to the results of the overall study.

4.2.1. Mike: Diving into the Digital and the Role of Polymedia

Mike's cON/FFlating (learning) space: Mike, 19 years old, lived with his parents and studied at a College for Higher Vocational Education in his final year. Beyond the social space of school, his main contact had been his girlfriend before the pandemic. Because of a fear of infection, his parents forbade him to meet his girlfriend during the first lockdown. This resulted in quarrels and a tense situation in the family, combined with his feelings of being cut off from the person who provided his major emotional support. Simultaneously, he described himself as a "gamer" (narrative, DC1), who spent large amounts of time online with his friends and social contacts. With the transition to remote learning, stay-at-home orders, and his difficult home situation, Mike dived into the digital. Mike spent most of his time using a variety of platforms in parallel for educational, leisure, and social activities and purposes (Figure 3).



"[08:30, 21.4.2020] Mike: So, you can imagine approximately how it looks like with me right now 😊 oh yes and of course I have just like actually most of the time my ps4 [PlayStation 4] turned on when you're already sitting next to it 😊👍😊 [...]"

[08:35, 21.4.2020] Researcher: Would you say the frequency of use of certain media has changed in the Corona time (curfew) compared to now where it's a bit looser? :)"

[08:41, 21.4.2020] Mike: yes, I'm more often on Instagram in between; Facebook I don't have, WhatsApp I have on my PC, from that I'm online there a lot, of course. Maybe it's also good to mention that I keep in touch with many friends from the class via Discord and we animate each other to do something for the school 😊😊 Yeah about the laptop is just Discord, WhatsApp, and Spotify and I'm just constantly on the Internet depending on whether I need something for school or even YouTube very often (usually also Netflix but I currently have no more series 😊) And on the other screen is currently running Fifa20, more often also Call of Duty (I play both mostly with friends 😊) Good question, I would say yes because it is a good way to prevent boredom or to just to keep in touch and otherwise in school I would rarely have the opportunity to do so 😊 just on YouTube I have feel I am through with every video of my subscribed channels by now 😊😊"

(MIMI chat log, DC1)

Figure 3. Mike's snapshot of his polymediated cON/FFlating learning space, taken during a MIMI, when he was studying learning materials on the screen to the left, gaming on the top screen, selecting music on his laptop, and taking notes on printouts on the bottom. (MIMI, DC1).

Whereas some media are used only for one purpose (e.g., Netflix for watching movies or WhatsApp for socializing), certain digital media allowed him to match his educational

and social purposes, e.g., the use of Discord allowed him to keep in contact with classmates and to (at least partly) motivate himself to proceed with his learning from home. Although he enjoyed being able to pursue his online leisure and social activities better than before the pandemic, he felt that the immediacy of practice and incentives to learn were less present outside the socio-material space of the school, thus resulting in detrimental consequences for his learning success:

“Basically, I have to confess that my grades have gotten a little worse through my own fault and downright demotivation from sitting around at home all the time. I even think it’s a bit of a shame that I didn’t have a normal Matura, because I’m a person who needs a bit of pressure to achieve better results. [. . .] Instead of more stress, I got real relief, and even when there was a lot to do at the beginning, due to the work assignments, I fell more and more out of the system, because it felt too much like a vacation”. (narrative, DC1)

After the lockdown was relaxed, and the Matura was written, he described his experience of the lockdown as an *“overdose”* (narrative DC2) of the digital, and described how he tried intensifying activities with friends in socio-material space as a result. He emphasized that he missed the feeling of freedom during quarantine, and now respects and wants to make greater use of these regained opportunities. Overall, Mike’s example shows how the mediatization of a student’s everyday space can bring ambivalent experiences for pupils. On the one hand, digital media use was supportive and resulted in a variety of positive experiences: it buffered tensions he felt in his home space; helped him socialize from home and feel connected to others despite being required to stay at home; and also offered at least some incentives to learn. On the other hand, his account still reflects his struggles in finding a balance in media use.

Scaling up (poly-)media use in the overall study: For most participants in the study, the first lockdown brought a tremendous shift to the digital, on the one hand, owing to the increased time spent on online schoolwork. On the other hand, for many participants, digital media provided an important social window *“to stay in touch with the outside world”* (Saskia, MIMI chatlog, DC1), thus helping pupils receive social and mental support (particularly through WhatsApp, TikTok, Instagram, Twitter, Snapchat, Facebook, Discord, Zoom, Skype, and various online games such as Call of Duty); mediate isolation; engage in leisure activities, such as following team sports (through apps such as Teamfit), watching movies, playing online games or finding new activities (such as cooking, online challenges or doing new online workouts). The MIMI chatlogs particularly revealed that many students were online from the time they woke up to the time they went to sleep. Through digital media, learning, and social and leisure activities were often pursued simultaneously. Although this is a general phenomenon among young people, for most of our study participants this simultaneous pursuit increased, owing to the lack of the regulation of smartphone use present in school environments (although to different degrees). Similarly, to Mike, other students had positive experiences with the mediatization of everyday life, but most of them struggled with setting boundaries between socializing or gaming online and educational practices. Some felt that being constantly online made them feel like being in many places (at school, at home, and with friends) all at once, and they struggled with finding a balance of navigating through their deeply entangled socio-material-technological spaces. Overall, most participants actively decreased their online activities after the lockdown was relaxed, and aimed to spend time outside and with others as much as possible. Furthermore, owing to the limited opportunities to meet offline, the pupils’ accounts reveal an increased appreciation of socio-material space.

4.2.2. Louisa: Striving for a Balanced Digital Media Use Amidst Complicated Family Relations and a Stressful Home Space

Louisa’s cON/FFlating (learning) space: 20-year-old Louisa was studying in her final year at a College for Higher Vocational Education in the spring of 2020. She was situated in what she termed a *“complicated . . . family situation”* (narrative, DC1), in which she had had no contact with her biological father’s family since she was six years old. She had moved into

her grandmother's apartment (for a time period undisclosed in the data). During the first lockdown, her fear of infecting her grandmother with the virus led her to isolate herself in her room, minimize her contact with her grandmother within the apartment and also reduce activities outside of the apartment as much as possible:

"I go out as rarely as possible (only for shopping), and I also abstain from walks that are still allowed. Also, in the apartment, I keep as much distance as possible and stay mainly in my room to do tasks for school or to talk with my friends on the Internet and play together. The only exception [when I see my grandma] is eating together at lunch and sometimes in the evening. This is also a very difficult time for my grandma". (narrative, DC1)

Her main pre-pandemic leisure and social activities, such as meeting friends offline, playing online games, and both participating in and coaching in a cheerleading club, were not fully interrupted but were substantially altered during the first lockdown:

"All these contacts (school, club, and friends from former schools) are minimized so that there is only contact via telephone or via video conference (especially used for the training sessions in the team to still have the feeling that you train together)". (narrative, DC1)

She increased her time spent online gaming, and the roles of co-players in her life became more important during the first lockdown. Online socializing came with new social pressures, because, she says,

"As soon as I am awake, I can be reached online. [. . .] This constant 'I'm online and available' is an unconscious pressure that you always have to be ready to give answers—to fulfill obligations in the form of duties, and which is of course much greater now than before, because everyone assumes that now with the curfew, EVERYONE is online anyway and has nothing better to do than chat and keep in touch with their friends". (narrative, DC1)

As a response to the pressure, she reported introducing "time for myself", when she can go "offline everywhere and specifically disconnect from contacts" (narrative, DC1) Simultaneously, Louisa rediscovered some old passions that she did not have time to engage in before the pandemic; during the lockdown, these passions helped her cope with the stressful situation:

"Drawing with different media and trying new ones, photography—I find the time again to keep my kind of diary (which by the way helps a lot to process the situation) and manage to keep my room tidy". (narrative, DC1)

After the gradual relaxation of measures in the early summer of 2020, she started meeting friends again and going outside, but the effects of the pandemic lingered, as she reports:

"I am still online a lot, but 'offline contacts' are no longer unattended". (narrative, DC2)

Louisa was situated in a socio-material home space that was stressful for her, owing to her fear of infecting her grandmother, combined with a lack of emotional support in the lockdown. Louisa reported missing the structure of her normal day and her regular activities (see also Section 4.1), and felt that learning in this situation demanded much more discipline. She felt that the pressure from her friends to be continually available online competed with dedicating time to learning, particularly because she had received only lists with learning tasks and had no further direct contact with her teachers. Simultaneously, her account shows how, after initial struggles with the increase in online activities, she managed to establish a new balance for herself through introducing offline time, establishing a new daily routine, and finding new pleasure in her altered leisure and social activities. We conclude from her descriptions that she learned with ease, self-organized her learning without support from teachers and family, and, despite her stress, managed to cope with remote learning and finalizing the Matura.

Scaling up family relations and home spaces in the overall study: The family relations and socio-material home spaces that our study participants described varied widely and had major effects on learning. Like Louisa, several of our participants had difficult and stressful

family or living situations. Several complained about lacking an appropriate or quiet learning space. Some lived with several siblings and reported that this resulted in noisy and stressful learning environments, or required them to take care of, or even home-school, younger siblings, because their parents could not take time off from work. Others reported family conflicts, either for the simple reason of spending too much time together or as a result of differing opinions regarding appropriate measures to take in the pandemic (also see the example of Mike above). However, other participants received strong mental support from their parents and/or enjoyed spending more time with them, thus resulting in a positive learning experience in this comforting environment.

4.2.3. Aurelia: Withdrawing from the Digital through Escape into Outdoor Spaces

Aurelia's cON/FFlating (learning) space: 18-year-old Aurelia lived in a house in a rural area, with a private garden space, in a socially supportive environment. Particularly during the first lockdown, she spent large amounts of time with her parents and younger sister, taking more walks and playing sports in nature. She also notes that her parents gave her and her younger sister chores to curb the time spent on their cell phones. Aurelia describes how being able to spend large amounts of time in the garden during the lockdown relaxed her and also encouraged her to study. In addition, Aurelia reports a very reflective and mindful approach to herself during the first lockdown. She was careful to maintain what she calls a "normal" sleep schedule (narrative, DC1), and made sure to eat a healthful and balanced diet, and to structure her day. She also scheduled conscious periods of relaxation in physical space, for example, by listening to music or painting, which she believes are good for her. However, she missed the socio-material closeness with her friends and had "the feeling that coronavirus steals [her] important time with them".

She reports a very reflexive use of digital media, either to keep in touch with her friends online and thus maintain her friendships or to consume entertainment online together with her family. Aurelia watched more television with her family during the stay-at-home orders—a practice that she plans to continue after the orders are lifted (MIMI, DC2). Otherwise, Aurelia very consciously and carefully distanced herself from the digital and/or scheduled periods of recreation occurring only in physical space. Regarding Aurelia's learning experience, she writes: "It's not great to be stuck in a situation like this in my baccalaureate year, but I'm coping quite well". She rated the remote learning and the amount of assignments that she received from her teachers as acceptable, because she still found sufficient time to prepare for her final exams on her own. The following MIMI shows the use of material space for recreation and sheds light on the simultaneous emergence of a new learning space by Aurelia, which is associated with a positive sense of well-being. Aurelia describes the effect of the garden as a place that motivates her to complete tasks for school there, such as reading a book (Figure 4).

Scaling up outdoor activities in the overall study: As our data show, access to natural and recreational spaces, i.e., the ability to retreat to a garden, balcony, or nearby recreational areas, such as a public park or forest, varied greatly among participants, depending on the locations of their homes and their living situations. This access greatly influenced the participants' well-being. Some study participants were more privileged than others, because they lived in larger single-family homes with private gardens in rural areas, such as Aurelia. Those who had access to these spaces emphasized their importance to well-being and consequently to learning. Others, such as Louisa, lived in apartments in cities with no access to private green spaces or balconies, further away from natural spaces. Several participants also reported a new relationship overall with nature and green spaces as a result of the pandemic and an accompanying new appreciation of material space for relaxation, spending time in nature, and sports activities, which are often described as a respite from the digital. In data collection phase 2, which occurred in the summer of 2020 after the initial lockdown, our participants expressed a desire to engage in pre-pandemic routines in socio-material space, such as various sports and recreational activities with friends or family in nature, and to intentionally withdraw from the digital (for an indefinite

period of time). The ability to spend time unhindered in nature and outdoor spaces was described as a newfound quality and, in some cases, a newfound sense of freedom.

16.04.20, 15:05—Researcher: 😊 do you still plan to go outside today?

16.04.20, 15:06—Aurelia: We just eat in the garden and actually I'm almost only outside 😊 [...] And with our dog I always go in the evening.

16.04.20, 15:08—Researcher: 😊 Does the garden and the possibility to be outdoors help you to get through the time well?

16.04.20, 15:10—Aurelia: Yes very—I always lie in our hammock and read and that motivates me to read books for school too 🙌



Figure 4. Snapshot taken by Aurelia during a MIMI, DC1: Reading a book for school while relaxing in a hammock in the garden.

5. Discussion

The aim of this article was to contextualize pupils' learning experiences as part of their embeddedness in complex socio-material-technological spaces during the period of their school-leaving examination in the early phases of the COVID-19 pandemic. Although the development of online education programs and learning tools occurred several years before the pandemic, these opportunities had not been widely used [61]. Our findings indicate that in the early phase of the pandemic, a widespread form of distance education involved the provision of online content by teachers, often through emails—a process that “neither constitutes learning nor teaching [. . .] Just giving access to content has little to do with learning activity and of course, nothing to do with interactivity” [33]. Furthermore, pupils were exposed to very different and often pieced-together approaches to learning, and they lacked experience with the learning platforms that were used. Overall, a high degree of self-organization under an unfamiliar and stressful crisis situation was required [35].

By applying the concept of cON/FFlating spaces and analysing the subjective narratives and in-situ experiences of our participants, we aimed to describe the depth of the complexities of learning spaces during the pandemic. The overall results reveal that successful Matura preparation, as well as remote learning in general, was often dependent on several factors. First, in addition to the students' own motivation and willingness to learn, the approach and commitment of the teachers were major factors [35]. Second, the pandemic greatly altered pupils' socio-material-technological everyday spaces and practices, including their home spaces, family relations, social and leisure practices, and (related) use of polymedia during the pandemic. We further discuss the main findings regarding our three research questions below, then close with a debate regarding the meaning of the results for future (remote) learning, both during and beyond the pandemic.

What did pupils' socio-material-technological learning spaces look like during the pandemic?

Our data show that the individually available space, and the social-material-technological assemblage in which they were embedded, tremendously influenced pupils' learning

experiences and activities. Prevailing inequalities were imposed and reinforced, with negative effects on learning [62]. Identified inequalities that affected remote learning in our sample included the different living environments of the study participants, which were associated with unequal privileges and challenges. These environments sometimes resulted in a lack of opportunities for retreat and in the loss of everyday spaces outside the living space, thus increasing stress. Accessibility to natural and recreational spaces, i.e., the ability to retreat to a garden, balcony, or nearby recreational area, varied greatly among participants, depending on the locations and design of their living spaces, and also markedly affected the well-being of the participants. Second, the diverging family situations in which pupils were embedded, ranging from conflictive to supportive environments, had important effects on pupils' well-being and their experiences of learning from home [63].

How did pupils adapt their digital media practices to cope with remote learning?

Overall, as before the pandemic [24], many young people spent much of their time online during the pandemic. Nonetheless, more of their learning, and social and leisure activities shifted online, into an even more diverse set of polymedia [25]. After being faced with the inevitable shift to remote learning, the participants in our study adopted a variety of digital media use strategies during the early period of the pandemic. Strikingly, they all applied individual and reflexive strategies in their engagement with, and use of, digital media, with the aim to achieve what they subjectively perceived as an appropriate balance of digital media use. These strategies ranged from minimizing their use for learning, social, and leisure activities; to struggling to achieve their own finely-grained balance of when and how to use them; to diving deep into the virtual world for perceived social, emotional, and learning support.

As Peil [45] has noted, the previously unfamiliar pandemic situation, combined with stay-at-home orders, resulted in forms of overcompensation, through the use of social media for the purpose of social proximity. Nonetheless, digital media's roles differed: for some participants, digital media use served important social and emotional purposes, and thus importantly supported their well-being and resilience; in contrast, other participants severely struggled with keeping a healthy balance of digital media use. Hence, it cannot merely be concluded that fewer media use for purposes other than learning automatically resulted in better learning success. Moreover, the positive effect of digital media in creating social proximity [45] was short-lived, because pupils returned to the face-to-face sociability that they had been yearning for after the pandemic measures were relaxed in the summer of 2020. At that time, many participants expressed a clear desire to consciously distance themselves (at least for some time) from digital media and to purposefully spend their free time in socio-material space. The desire to resume familiar pre-pandemic routines in socio-material space, such as leisure activities with friends in nature, was strong and was described as a newly discovered quality and, in some cases, a newfound sense of freedom. In this regard, our findings are in agreement with those from previous studies arguing that digital collectivity cannot replace the quality of offline collectivity: "The Internet cannot replace offline meetings, activities, and interests, but rather enhance, promote, and expand them" [23] (p. 44). Nonetheless, our data indicate that digital media use during the pandemic has triggered shifts in organizing learning, the quality of friendships and choice of friends, and lasting reflections on digital media use and its effects on young people's lives.

How did the pandemic influence pupils' learning experiences and success?

The transition from socio-material schooling to different methods of remote learning varied in success and was differentially embraced by the young study participants. Many participants adapted quickly to the disruptive spatial changes. Some participants were able to organize themselves very well in isolation and prepare for the Matura in a goal-oriented manner. Others, however, particularly those who found themselves in stressful learning spaces, had substantial difficulties with the isolated learning situation; reported a high psychological burden and more stress than that in the regular socio-material classroom; and expressed worries and fears about the Matura exam, and strong demotivation regarding

their own willingness to perform. Fears about the future were also reported several times, as were concerns about a devaluation of the Matura itself, owing to the changes in examination mode. As in other studies [64], the data from our study show that pupils who were already struggling in regular socio-material classes reported additional stress and more psychological pressure during isolated remote learning. We, therefore, argue that this group of pupils should receive more support in the face of the ongoing and uncertain pandemic situation, to prevent the risk of their being forgotten altogether.

Several studies, despite strong regional variances, have suggested that pupils have experienced a short- and long-term learning loss or a decline in learning [35]. According to Sabol [38], learning loss and declines in student achievement will persist as remote learning and access to digital devices, the Internet, budget cuts, and other important resources on which rich learning depends continue. School leaders and policymakers must take action to effectively address learning losses and support programs that effectively remedy such losses [38].

6. Conclusions

This article showed that young people in their education and qualification phases were greatly affected by the abrupt, profound, and sometimes highly stressful spatial changes during the pandemic. The findings also revealed a great variety of reflexive and active (digital media) practices used to cope with life and learning in the pandemic, thus demonstrating pupils' agency and resilience. Our findings support the claim that the common framing of existing school research on the digital as the "new space" does not do justice to the experiences of young people [22], and additionally restricts possibilities for improving remote learning, educational and learning spaces. Regarding future research, we argue that more qualitative analyses of pupils' strategies are needed to understand the complexity of the deeply entangled socio-material-technological spaces in which students were situated during the COVID-19 pandemic, particularly the repeated periods of lockdowns and remote learning. Unravelling these entanglements of social, material, and technological learning spaces provides encompassing in-depth insight, which is difficult to capture in quantitative studies.

With regard to policy-making, we argue that not considering both this entanglement, and pupils' own agency and reflexive strategies in using digital media for their own resilience, prevents the potential of remote learning [65,66] from being fully realized in both crisis situations and normal circumstances. Future concepts for the education sector must be developed to prepare for future crises. Despite its challenges, the changes that the pandemic entailed regarding the push toward digitization in the education sector [67] must be embraced to a greater extent. Whereas Torda [65] has described a revolution in education that will continue post-pandemic through the use and expansion of technology in education, we do not currently envision this being the case on a larger scale. New technology-based teaching and learning practices must involve all stakeholders—pupils, teachers, developers, and policymakers—in an adaptation process [66]. SNSs, although not intentionally designed to support educational activities, can contribute to sustainable educational activities, but they remain under-researched in formal education [37]. Although their availability and ubiquitous use by pupils and teachers make SNSs difficult to avoid, their integration in formal education must be closely associated with learning formats that empower pupils to engage in informed and responsible use of digital media, and allow them to become mature digital participants [68,69] in society.

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