KU LEUVEN

FACULTY OF PSYCHOLOGY AND
EDUCATIONAL SCIENCES

METHODOLOGY OF EDUCATIONAL SCIENCES RESEARCH GROUP

(Un)bordering European Education

Social Topological Accounts of Online 'Openness'

Karmijn van de Oudeweetering

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Supervisor: Prof. Dr. Mathias Decuypere

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Wijsheid

Wijs is anders dan geleerd
nee … geleerd is niet verkeerd
maar wijs, dat is heel and're koek
minder hersens … minder boek
wijsheid is voor 't grootste part
iets meer dan denken met het hart.

Toon Hermans (2016). *Wijs is anders dan geleerd*. Lannoo.

Samenvatting

Deze dissertatie werpt een kritische blik op het fenomeen 'Open Onderwijs' zoals deze heden ten dage verschijnt in online vormen, waaronder Massive Open Online Courses (MOOCs) en Open Educational Resources (OER). Het kijkt daarbij specifiek naar initiatieven die gefinancierd of anderszins ondersteund zijn vanuit Europees onderwijsbeleid. Op basis van discussies die leven over dit nieuwe fenomeen, stelt de dissertatie vragen over de specifieke invulling van 'openheid', onderwijs, en de betrokkenheid van Europees beleid in deze initiatieven. Terzelfdertijd beoogt de dissertatie kwalitatieve methoden te exploreren en voor te stellen die het toelaten om de specifieke eigenschappen van deze online en transnationale initiatieven te begrijpen.

De theoretische bronnen voor het empirische en methodologische werk komen uit de literatuur over sociale topologie, een benadering die geïnteresseerd is in de manier waarop mensen en dingen met elkaar in relatie staan. Meer bepaald gaat sociale topologie na hoe relaties tussen mensen en dingen bepaalde *vormen* aannemen, en wat voor soort ruimtes-tijden daarmee in het leven geroepen worden. De dissertatie focust op relaties die begrepen worden als (onderdeel van) 'infrastructuren' en 'architecturen' van online onderwijs initiatieven. De noties 'grenzen' en 'begrenzende praktijken' worden aangevat om uit te lichten hoe, waar, en wanneer deze relaties – ogenschijnlijk 'eindeloos' vervormbaar in hun online constellaties – concrete vormen aannemen. De methoden die op basis van deze theoretische aannames en noties ontwikkeld zijn combineren, wat betreft dataverzameling, aandacht voor praktijken *op, met,* en *voorbij* user interface(s). De methoden voor analyse worden gekenmerkt door markeringen, gedetailleerde beschrijvingen, visualisaties, en typeringen.

Deze bronnen en methoden zijn aangewend in vijf empirische case studies. De eerste studie kijkt naar één MOOC platform, *EMMA*, en toont aan de hand van 'navigaties' en interviews met ontwikkelaars hoe 'openheid' ontstaat uit bepaalde 'begrenzingen'. De tweede en de derde studie gaan over één specifiek format binnen de *Erasmus+ Virtual Exchange.* Zoals naar voren komt in het (online) veldwerk, brengt dit initiatief (niet-)Europese jongeren bij elkaar en moedigt aan tot leren over verschillen in en over landsgrenzen. De vierde studie focust op *OLS* en *Blend-in,* twee initiatieven die tijdelijk geopend zijn voor migranten en vluchtelingen, en toont aan de hand van navigaties hoe een bepaald soort Europa geconstrueerd wordt 'op het scherm'. De vijfde studie richt de aandacht op MOOCs van *twee Europese universiteiten* en toont, aan de hand van verschillende methoden, hoe deze een mix van 'gesloten' en 'open' vormen van feedback in het leven roepen. De dissertatie besluit met het belang van deze resultaten voor een onderwijslandschap dat, ook sedert de aanvang van dit doctoraatsonderzoek, sterk en snel verandert en waarbij 'openheid', 'onderwijs' en Europa steeds aan nieuwe invullingen en vormen onderhevig zijn.

Abstract

This dissertation deploys a critical perspective on the phenomenon of Open Education, appearing today in online forms such as Massive Open Online Courses (MOOCs) and Open Educational Resources (OER). It specifically focuses on initiatives that are financed or otherwise supported by European education policy. Based on ongoing discussions in the field, the dissertation asks questions about the specific enactments of 'openness', educational relations, and the involvement of European policy in these initiatives. Simultaneously, the dissertation aims to explore and set out qualitative methods that support empirical studies in grappling with the specificities of these online and transnational initiatives.

The theoretical resources for conducting the empirical and methodological work are based on the literature about social topology, an approach interested in relations between people and things. More specifically, social topology examines how such socio-material relations establish particular *forms*, and what kind of spaces-times are thereby brought into being. In the operationalization of these relations, the dissertation focuses on practices that are understood as (part of) 'infrastructures' and 'architectures' of online education initiatives. The notions of 'boundaries' and 'bordering practices' are taken up to elucidate how, where, and when these relationships – seemingly 'endless' in their online constellations – are made manifest in concrete forms. The methods of data collection that are developed, based on these resources, focus on practices *on, with,* and *beyond* user interface(s). With respect to data analysis, the methods are characterized by a combination of illuminations, detailed descriptions, visualizations, and typifications.

The theoretical resources and methods are deployed in five empirical case studies. The first study looks at one MOOC platform, *EMMA*, and demonstrates through a combination of 'navigations' and interviews with involved developers, how openness emerges through particular 'boundaries'. The second and third study focus on one specific format within the *Erasmus+ Virtual Exchange*. As emerges from the (online) fieldwork, this initiative brings young (non-)European people together, and encourages them to learn about differences in and across national borders. The fourth study zeroes in on *OLS* and *Blend-in,* two initiatives that have been temporarily open to migrants and refugees. The study shows through navigations how these initiatives construct a particular kind of Europe 'on screen'. The fifth study puts the spotlight on the MOOCs of *two European universities* and shows, based on a mixture of methods, how these generate an entanglement of 'closed' and 'open' forms of feedback. The dissertation concludes with the relevance of the findings for an educational landscape that, also since the start of this doctoral research, has been changing rapidly and in which 'openness', 'education', and Europe are continuously subject to new forms and enactments.

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It is almost six years ago, but I remember it vividly. The vacancy for a research assistant at the KU Leuven. The enthusiasm, the preparation, the train ride, the interview, the email, the phone call. Was I going to do it? Yes! Not knowing where I would end, or even start.

Now that the dissertation is wrapped up, stacks of papers are read about the definition of education, and conferences urged me to re-think educational concepts, I can at least say that the period between the start and end can be called a process of 'formation'. I am still the person who started the PhD – but not the same. It has been lonesome at times, and doing the desk research definitely made me empathize with the figure of the 'self-directed' but also isolated MOOC learner that I saw emerging in the literature. But in those moments that I could reach out, and *open up*, to initiators, designers, teachers, administrators, policymakers, and students, those feelings dissolved: these people formed the community that made this dissertation possible. In this regard, I would like to start with a special thanks to those who are mentioned as research participants in this dissertation. Your contributions have been more than empirical data.

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General Introduction

This dissertation deploys a critical perspective on the phenomenon of 'Open Education' as it appears in online formats such as Massive Open Online Courses (MOOCs) and Open Educational Resources (OER). It particularly focuses on Open Education initiatives that are commissioned, financed, or otherwise supported by European policies. The rationale for this focus is based on the educational, political, and academic developments going on at the time that the work on this dissertation started, in the fall of 2017. New, online forms of Open Education had already made their entrance and had been received with varying commentaries, questions, and appraisals, not least about their defining characteristics. In general, OER have been characterized as digital 'learning objects' (e.g., textbooks, videos, software packages) that are published under Creative Commons (CC) licenses that allow people to (re-)use, revise, remix, and redistribute the contents (Wiley, 2015). The initial purpose of OER was to enable teachers to share and build on existing teaching materials instead of having to buy expansive standard textbooks or develop their own from scratch (Weller, 2014). OER have been mainly disseminated through repositories (i.e., websites that allow materials to be uploaded and downloaded) which, in turn, have been initiated by various individuals, institutions, and governmental organizations (Atenas & Havemann, 2014). Two of the largest OER repositories are MITs 'Open Courseware' and The Open University's 'OpenLearn' which attracted, respectively, 4.23M and 2.56M visits in the year 2021 (Perifanou & Economides, 2022). The European Commission has also launched OER repositories, including 'Open Education Europa' (active between 2013-2018) and EPALE (active since 2014 - present), with the explicit aim to provide common gateways to OER made across different Member States (European Commission, 2022; Sabadie et al., 2014). MOOCs, in their turn, have been characterized as collections of OER that constitute (more-or-less) coherent courses (Weller, 2014). Different variations in the MOOC landscape emerged, starting from *connectivist* MOOCs (in short, 'cMOOCs'). Connectivism exists as a pedagogical orientation before and beyond MOOCs and is based on the assumption

that existing learning theories (i.a., behaviorism, cognitivism, and social constructivism) are not sufficient to understand and guide the complex learning processes induced through fastly changing online information 'ecologies' and interactive peer-to-peer networks (Siemens, 2014). As a materialization of this pedagogical paradigm, cMOOCs have prioritized non-linear learning paths, peer interactions, and the integration of multiple media and platforms to facilitate the exchange of ideas and learning objects (i.e., OER) (Ebben & Murphy, 2014; Milligan et al., 2013). Another category of courses is denoted by the term 'xMOOCs', which relates to the *extended* MOOC. It is a format that emerged as universities seized the possibilities of platforms to 'broadcast' their courses, hence, to establish 'extensions' of their on-campus practice (Knox, 2017). xMOOCs are not explicitly informed by a learning theory but they tend toward an instruction-based 'independent study model' with dedicated sequences of video lectures, multiple-choice tests, and/or peer assessments with standard grading schemes (ibid.). xMOOCs gained traction in 2012, announced as 'the year of the MOOC', and were accompanied by an expectation that these online forms would radically disrupt how universities organized their classes on and beyond the campus (Daniel, 2012; Yuan & Powell, 2013). The popularity of these MOOCs has been invigorated through platforms that provide convenient formats for universities and, although with some fluctuations, appeal to large amounts of 'learners'. In the year 2017, the largest platforms for xMOOCs (Coursera and edX) attracted, respectively, 30 million and 14 million learners, while in 2021, these numbers had increased to 97 million and 42 million (Shah, 2018, 2021). Similar to the trend of OER, the European Commission has supported initiatives for MOOCs through temporary funding schemes, including the European Multiple MOOC Aggregator and OpenupEd (EMMA project, 2018; OpenupEd, 2022).

This introductory chapter is purposed to expound on the developments in practice, policy, and research regarding Open Education that informed the direction of this dissertation. This includes, in consecutive order, questions about the 'openness' of these forms of education, their implications for the field of education, and the

involvement of European policy in the emerging trend of Open Education. After dedicating the next three sections to these developments, the fourth section of this chapter explicates the aims and research questions that guided this dissertation. Subsequently, the fifth and equally final section provides a guide through the chapters that follow, which include explanations about the theoretical, conceptual, and methodological tools that are deployed, the empirical case studies that are conducted, and intermediary reflections.

Questions about openness

When forms of Open Education started to multiply in number and variations at the beginning of the 2010s, questions about what defined them as 'open' became central in academic and popular debates. These discussions have started with the ideological arguments of the 'Open Education movement' – a movement that inaugurated the initial experiments with OER and MOOCs – which emphasized that openness is about relinquishing educational practice from the bounds of institutions (Araya et al., 2012; Ponti, 2014; Weller, 2014). With the proliferation of more *online* education initiatives, these arguments started to conflate with the rhetoric that online learning is immediately 'open' as it allows learning to take place 'anytime, anywhere' (Brown, 2016; Sheail, 2018). These conflating arguments about openness resulted in critical commentaries from various directions. For instance, sociologists challenged the claim about learning 'anytime, anywhere' because this disregarded the different means, needs, and capabilities people need to connect to these educational initiatives (Liyanagunawardena et al., 2013; Selwyn, 2011). More specifically, these scholars did not only emphasize that many people in the world do not have the (sufficient) digital means to follow these online courses, but they also stressed that the learning materials are generally in English, and focused on 'Western' topics that are irrelevant to many local contexts (see also Crea & Sparnon, 2017; Czerniewicz et al., 2016; Rambe & Moeti, 2017). Next to this, historians noted the long tradition of forms of 'openness' in education – ranging from public lectures in monasteries during the Middle Ages to

Open Universities founded from the 1970s onwards – that gradually transformed into new configurations with exclusive characteristics (Peter & Deimann, 2013; Tait, 1996). Taking up this historical lens, some scholars pointed to the privatizing and exclusionary tendencies of contemporary forms of Open Education too. This includes the way that institutions partner up with large platforms – like Coursera, edX, and FutureLearn – to 'monetize' MOOCs through paywalls, marketing strategies, and using them as cost-effective substitutes for on-campus courses (Alevizou, 2015; Baker, 2017). Similar responses came from the perspective of the field of political economy. Scholars noted that, in parallel to the development of OER repositories, there was a surge of 'digital content platforms' (e.g., Curiosity.com, KhanAcademy, or TED) with proprietary materials, advertisements, and paywalls that are published as forms of 'open' online education (Moe, 2015). The term 'openwashing' emerged to signal these forms of openness with a small 'o', which encompass initiatives that exploit the language of openness to monetize 'free' content through invisible mechanisms – including selling commercials and users' data (Wiley, 2015). These critical concerns gave rise to a new philosophical standpoint regarding openness, which balanced the initial claim about a 'revolutionary' movement that could democratize higher education once and for all. More specifically, this standpoint considers that each effort to 'open up' education comes with new closures that, in turn, imply particular *values* (Bayne et al., 2015; Edwards, 2015).

While these discussions arose especially around the time that the work on this dissertation started, a current trend of educational papers appears to accept a conflated notion of 'open' and 'online' education. For instance, while the variety of contemporary journals such as *Open Learning, Open Education studies,* and the *European Journal of Open Education and E-Learning Studies* manifest the ongoing interest in Open Education, their recent publications show how 'openness' is increasingly attached to online versions of university courses without questioning (Lee, 2021; Marín et al., 2022; Yildiz & Sural, 2019; Zafras et al., 2020). Moreover, it is no exception that studies refer to MOOCs and OER as part of universities' repertoires to extend,

continue, or substitute on-campus classes for those in need and further away, especially during the refugee crisis or the COVID-19 pandemic (Bylieva et al., 2020; Eradze, Dipace, & Limone, 2020). This seems to suggest that a critical engagement with the denominator 'Open' implied in MOOC and OER has lost traction, in favor of a more immediate association between 'online' education and openness. At the same time, the increasing reliance of educators on online educational tools and platforms – not least invigorated through the COVID-19 pandemic – heightened many of the online modes of education do not adhere to the principles of 'openness' initially proposed by the Open Education movement (e.g., Williamson et al., 2020). This shows the importance of continuing empirical research about online education initiatives that are loosely or more strongly associated with the adjective 'open', to scrutinize their inherent closures, and to reflect on whether the values they endorse are justifiable (see Edwards, 2015).

Questions about education

These discussions about openness have been emerging in tandem with critical questions about the implications of Open Education initiatives for educational practice. To start with, scholars in the field of education raised concerns about the implicit assumptions inscribed in popular platforms and policies regarding Open Education. Following their inquiries, these platforms prioritize discourses regarding human capital creation (e.g., allowing 'lifelong learning' to meet demands of the knowledge economy) and technological 'solutionism' (i.e., fixing inequalities or issues of financing public education) over pedagogical rationales (Edwards, 2015; Knox, 2013; Moe, 2015). At the same time, these scholars note the potential of Open Education to engender emancipatory practices, such as new forms of interactions on platforms, and communities that share their knowledge and materials instead of opting for standard expansive textbooks (ibid.). Relatedly, scholars critically engaged with the possible consequences of OE initiatives for the field of formal education, including the tendency of universities to use Open Education initiatives to 'brand' themselves and/or to substitute (parts of) on-campus classes, while pressuring teachers to develop materials

for these initiatives without remuneration (see supra, but also Hall 2015; Daniel 2012; Winn, 2015). This raised questions about whether MOOCs would change the responsibilities of academic teachers, as they are increasingly performed as, and/or expected to be, 'rockstars' who capture the attention of as many students as possible, 'facilitators' of personalized efficient learning paths, or 'functions' that can be automatized (Perrotta et al., 2016; Ross et al., 2014). Other critical questions were raised about the emergence of Learning Analytics on MOOC platforms. This constitutes a field of research that produces and processes clickstream data with the ambition to 'optimize' learning while relieving some of the burdensome tasks for teachers, for instance, through dashboards that give automated and personalized feedback (e.g., Gašević et al., 2015). Critical responses highlight that the knowledge and tools generated through Learning Analytics are focused on particular kinds of individual performances (i.a., completion, and 'correct answers') while pushing educational values like collaboration, equality, and in-depth understanding to the background (Knox 2016b; Veletsianos et al., 2015; Van Dijck & Poell 2015). These questions thereby address whether these MOOCs increasingly push students to be a particular kind of 'self-regulated' and 'active' learner, and what this could mean for their stance toward others, and society more broadly (Perrotta et al., 2016; Perrotta & Williamson 2018; Knox 2018).

While these concerns have been formulated already early onward in the MOOC and OER development, some of the anticipated developments have become more of a widespread reality. For instance, there is a prevalence of studies focused on making OER and MOOCs profitable for universities, and an 'effective' means for individual learning outcomes, based on the big data generated through platforms and the sophisticated statistical models that can be built through that (e.g., Alshehri et al., 2021; Kostopoulos et al., 2021). Scholars with a critical approach to these developments have, in this vein, considered MOOCs as part of the infrastructure of datafication and marketization in higher education rather than as means to 'open up' new ways of teaching and studying beyond the institution (Jacobson, 2019; Jarke &

Breiter, 2019; Johanes & Thille, 2019; Williamson, 2018b, 2021). Even though this seems to fit a general image of Open Education as a 'wave' that is overwhelmingly and irreversibly changing educational practice, there is also an acknowledgment that these developments do not totalize nor determine the consequences for the field of education (cf., Decuypere, 2018). That is, there is a growing consideration for the possibilities that Open Education engenders for educators and students to engage with online technologies in ways not previously imagined (Knox, 2017, 2018; Storme et al., 2016). In this regard, there is much to learn about the variety of practices that Open Education initiatives 'open up' in different settings.

Questions about Europe

At the same time that these discussions about Open Education evolved, European policies showed a renewed involvement with this phenomenon. That is, while there had already been European policy attention for 'open learning' through mail, radio, and television since the 1980s (Tait, 1996), the first European policies regarding *online* forms of Open Education included the 'Rethinking Education' strategy (2012) and the communication 'Opening up Education' (2013). These new policies focused on the development and use of OER and MOOCs, explicitly motivated by the need to 'invest' in the skill development of the European workforce while being faced with budget cuts in public resources due to the preceding European 'debt crisis' (Sabadie et al., 2014). Moreover, the European policies considered the need to 'keep up' with the Open Education offerings from other continents (ibid; European Commission, 2013). Based on these rationales, the European Commission financed and promoted various Open Education initiatives – ranging from single courses to full repositories (Lazetic et al., 2015). Moreover, the Commission furthered a three-year research project that queried how Open Education initiatives could be integrated into European higher education institutions – following a new definition of Open Education as an attempt to broaden access to, and enhance connections between, (non-)formal and non-formal education, with or without openly licensed materials (Inamorato dos Santos et al., 2016).

The first shifts in this policy orientation appeared rapidly as, in 2016, the European Commission had stopped monitoring MOOCs and OER through its "European MOOC Scoreboard", thereby relinquishing its instrument to supervise and govern the development of Open Education (Goglio, 2022). Moreover, at the start of 2018, the first Digital Education Action Plan was launched by the European Commission, which shifted the focus from the development of 'open' resources toward the use of online platforms for purposes of (responsible) data production and analysis (European Commission, 2018). After that, a second Digital Education Action Plan (European Commission, 2020b), a renewed Erasmus+ program (2020), and continuous 'Education and Training Monitors' (European Commission, 2022) persevered the push toward 'platforms' and 'Learning Analytics' while the discourse around 'Open Education' faded. Notably, this shift from an emphasis on 'openness' toward a more general call for online education appeared around a time in which 'being open' had become more controversial for Europe. That is, the peak year of the so-called 'refugee crisis' was 2015, and the European Commission was urged to develop Action Plans to 'manage' these unplanned mobilities through extended public services – including online education initiatives for people at the 'borders' of Europe (European Commission, 2015b, 2015a). After that, the COVID-19 pandemic impelled the European Commission to substitute face-to-face, on-campus events with 'digital toolkits' (cf. OER repositories) and 'online courses' (cf. MOOCs) (All Digital Weeks, 2022; Code from Home, 2022; European Commission, 2020c). Hence, these *new* 'crisis situations' urged the European Commission to use modes of online education to intervene in the formal education sector, rather than attempting to develop an 'openness' that stretches beyond them.

What appears consistent throughout these developments – starting from the non-digital 'open learning' initiatives to online platforms without a strong affiliation with openness – is that the European Commission has motivated these education initiatives for their ability to 'strengthen a European identity' (European Commission, 2017; 2020; Tait, 1996). Particularly, the Commission considered that these initiatives

enhance the spread of shared cultural resources and knowledge among (migrating) citizens across different Member States (ibid.) This motivation is also expressed through the vision of a 'European Education Area' (EEA) *"in which teaching, learning, and doing research would not be hampered by borders"* (European Commission, 2020, p. 89). Important for this dissertation is the tension between this vision of a 'borderless space' – which fits the discussed arguments around 'openness' – and the continued claim on a European identity, which assumes a delineated specificity. In this regard, the dissertation draws on an established field of scholarship that has interrogated European education policies and its specificities in (student) mobility programs, cross-border research projects, and networks (Landri & Neumann, 2014; Lawn, 2001; Nóvoa & Lawn, 2002; Souto-otero & Beneito-Montagut, 2016). That is, these studies show that a specific kind of individualized, flexible, and predictable European learner is aimed for in these policies, which also means that certain persons and practices are *not* supported (ibid.). In this sense, there is still much to explore about how the policies regarding Open Education connect to these broader European policy ambitions, and how ideals around openness and education are materialized herein.

Research aims & questions

This dissertation aims to respond to these developments and related questions about the phenomenon of Open Education. It does so through an empirical engagement with initiatives that have been supported by European policies. The research aim is to describe and theorize notable trends in and across these initiatives and, thereby, to formulate insights about the enactment of 'openness', the implications for educational practice, and the involvement of European policies. In this vein, the research questions that inform this dissertation are:

- what is Open about European Open Education?
- what is Educational about European Open Education?
- what is European about European Open Education?

These research questions are not deployed to establish fixed and separate lines of inquiry. Rather, they are used to guide an exploration of the entwinements and evolvements in the field of European Open Education. In this light, the dissertation will also consider how 'openness' is gradually conflated with other 'online' forms of education, how education relations are continuously reshaped, and how European policy continues to change its involvement in open and/or online education. In other words, this dissertation acknowledges that the research questions could evolve together with the developments in the field.

In order to conduct these inquiries, this dissertation also pursues a methodological aim. That is, starting from the observation that there is not 'a' qualitative method to analyze educational websites (Decuypere, 2018), the dissertation explores, documents, and elaborates on research practices that support the empirical engagement with Open Education initiatives in Europe. The intention is thereby to respond to the wider need for methodologies that allow scrutinizing and theorizing the 'openness' of these educational platforms while integrating the inherent political dimension of the European transnational policies (Edwards, 2015; Knox, 2016b; Savage & Lewis, 2018). At the same time, the intention is not to arrive at a single methodological solution but to reflect on the possibilities and limitations of different practices, and how this can inform future research about educational platforms.

The following chapters

The following chapters report on the research that has been done for this dissertation, including how it has been done and what insights are generated. Chapter 2 elaborates on the theoretical premises, conceptual resources, and ideas about methods that informed the work on this dissertation. The intention is to familiarize you, as a reader, with the main principles regarding *a socio-material orientation* and *social topology* that informed this dissertation. Moreover, the chapter includes initial, non-exhaustive explanations about recurrent concepts and methodological ideas that include *infrastructures, architectures, boundaries,* and *bordering practices*. After that, Chapter 3 to

Chapter 7 report on the empirical case studies that were conducted, and show how these theoretical, conceptual, and methodological ideas are applied in different ways. These chapters are slightly adapted versions of articles that are published or submitted for publication in peer-reviewed journals, whereby the adaptations made in the context of this dissertation are solely purposed to enhance the readability of the texts. Each empirical chapter builds on the general framework of theoretical premises, concepts, and methods, which means that there is a notable overlap in their introductory notes. However, each chapter also demonstrates how it has invoked its 'own' resources to zero in on the specificities of the studied cases and research problems. Especially because the chapters present the case studies in the chronological order in which they are conducted, they also surface how theoretical, conceptual, and methodological ideas unfolded over time.

Chapter 3 reports, accordingly, on the first empirical case study that is conducted in light of this dissertation. The case study focuses on the European Multiple MOOC Aggregator (EMMA), a platform that provides a format for MOOCs from European universities and that integrates a translation system to make these MOOCs available in multiple European languages. The initiators of this platform formulated specific conceptualizations of the 'openness' of the platform and, as a response, the case study endeavored in analyzing how this openness is realized. By combining interviews with staff with a method for navigating 'on' the user interface, the case study developed several descriptions of practices that are understood as forms of openness. These descriptions are accompanied by visualizations that give a more graphical overview of these different forms. The results lead up to the main argument that openness is concretized through *boundaries* that, rather than merely closing off, make the platform a complex of multiple spaces and times that are 'open' to different people yet in particular limited ways.

Chapter 4 then presents the second empirical case study, which focuses on a set of activities within the Erasmus+ Virtual Exchange (E+VE) initiative. E+VE is called for by the European Commission with the aim to extend 'physical' Erasmus exchanges through online exchanges, specifically online discussions among young

people from European and Southern Mediterranean countries about social-political topics. The case study focuses on activities that are referred to as 'Interactive Open Online Courses' – courses that combine an 'xMOOC' format with weekly synchronous dialogue sessions in small groups of students. The question that is central to this case study is what typifies the educational character of these activities. By analyzing the (infra)structure of the platform, participating as a student in one of the courses, and conducting interviews with different staff members, the case study has formulated several findings. First of all, the case study stresses how the technologies of this initiative emulate 'typical' educational settings – including closed groups, stable arrangements, and 'fixed' curricula. At the same time, the online constellation allows students to 'move' in a new way – urging them to move 'out' and come back 'in', and to deal with differences and similarities across different locations. Visualizations are, in a similar vein, used to graphically show how these forms and movements are set up. The argument that emerges from this study is that Open Education does not necessarily imply a 'disruptive' force, but introduces changes that combine 'typical' education practices with new roles and relations among educational actors.

The third empirical case study, presented in Chapter 5, taps into the same set of activities in E+VE but focuses on the question of how these activities relate to Europe and the proclaimed ambition to deal with nationalism. Moreover, the case study focuses on the experiences of students and teachers in one university who are, through their curriculum, involved in this initiative. The methods involve an analysis of the website, relevant documents, and on-campus fieldwork, which are presented through descriptions as well as visualizations. The visualizations in this study are particularly purposed to showcase the multi-layeredness of different practices. The findings of the case study build toward the claim that this initiative does not so much establish a 'transnational' activity – which is how it is framed within European policies. Instead, the complex and layered practices engendered through this initiative can be considered 'translocal', as they prioritize connections between different places, moments, and persons rather than across countries.

Chapter 6 reports on a case study that focuses on two initiatives that are cataloged in the European platform MOOCs4Inclusion, which are named Online Linguistic Support and Blend-in. These initiatives are all supported by the European Commission to provide educational materials to refugees and migrants during the so-called 'refugee crisis'. This study is interested in what kind of Europe is being constructed 'on the screens' of these initiatives, and how this relates to the 'time of crisis' that is being invoked. Based on this interest, the case study adopts a method of 'active navigations' which implies that the movements produced through the user interfaces are critically analyzed. The findings highlight how these initiatives engender differentiated and temporary movements for migrants and refugees, which stands in contrast to the more flexible, personalized, and prolonged movements granted to Erasmus students. Next to this, the findings emphasize that (educational) institutions continue to play an important role in determining who moves through these initiatives, and how. In this way, the case study argues that the European education spaces that are invoked through online learning initiatives are multiple and changing but continue to prioritize the authority of institutions, and its 'natives'.

Chapter 7 reports on the last empirical case study conducted in this dissertation, and addresses the practices of designers, instructors, and learners within MOOCs of two larger universities. The main interest of the case study has been to develop an understanding of how feedback – as an educational practice – is enacted within these MOOCs, and whether and how these follow the 'closed' model of a feedback loop. A wide array of methods is deployed, including navigations through the MOOCs, document analyses, as well as observations and interviews with designers, instructors, and learners. The various insights are integrated into visualizations of loops and lines, developed with the aid of a data visualization tool. Based on these visualizations, situations are highlighted that surface the complexities of feedback in these MOOC configurations. In this way, these findings show how 'closed' feedback loops are entwined with more open-ended practices. Moreover, the findings emphasize that there is no singular learning theory nor a singular actor that determines how feedback in MOOCs is realized. Rather, feedback evolves through the ways that

people – designers, instructors, and learners – exert their agency while engaging with the digital technologies of MOOCs. In this sense, the case study demonstrates how online forms of Open Education does not 'optimize' an educational practice but that it introduces changes that come about through the human decisions that are made.

While the case studies are thus presented in separate chapters, this dissertation aims to showcase how they constitute integrated parts of a research line that builds toward broader empirical and methodological claims. For instance, the chapters show how initial explorations of the multitude of 'boundaries' within MOOC platforms have progressed into more detailed descriptions of specific 'forms', their educational potential, and the role of platform mechanisms herein. Throughout, more specific arguments about the role of European policy and (other) educational institutions are built. Furthermore, the chapters show how methods for scrutinizing practices 'on' and 'beyond' user interfaces have been gradually refined through the development of dedicated protocols and conceptualizations, and how they are extended through methods for analyzing practices 'with' user interfaces. To render the development of these ideas more explicit, each chapter is followed by an 'intermezzo' – a short reflection on the insights that are yielded regarding European Open Education as a field, and regarding the development of the methods. In this way, the intermezzos document how this dissertation builds its answers to the research questions in a step-by-step manner. These answers, in turn, are presented in the final chapter, the discussion, which taps into each research question separately but also reflects on what the answers imply in their overlap, and in the current and evolving conditions of the landscape of European Open Education.

Chapter 2: Theories, concepts, methods

Theories

Effectiveness

Early overviews of the literature regarding Open Education show a trend of 'theory agnostic' research interested in the 'effectiveness' OER and MOOCs, measured in terms of their ability to achieve learning outcomes with (lower) financial investments in these technological 'solutions' (Atenas & Havemann, 2014; Ebben & Murphy, 2014; Knox, 2013a; see also Shawn, 2012). These studies grew with the proliferation of Learning Analytics in MOOC platforms (see Chapter 1: digital data generated and analyzed through online environments with the purpose of understanding and optimizing 'learning'). That is, the abundance of data about learners' clicks gave rise to the assumption that all learning practices related to MOOCs and OER are captured and, hence, mediated by platforms (Daniel, 2012; cf. Venturini et al. 2018). These developments attracted a field of data science that recognized the potential of MOOCs and OER as testbeds for 'what works' to enhance particular performances, and that negated the need for educational theories based on the idea that knowledge was to be 'found' in the vast amounts of data (Williamson, 2017b).

Responses to these developments have been mixed, including voices in and beyond the field of Learning Analytics that stress the need for theoretical models that prioritize learning objectives, and that take into consideration the contexts of learners, their needs, and their perceptions (Gaševic et al., 2015; cf. Larmuseau et al., 2018). While appreciating these voices for explicating what technology is evaluated upon, this dissertation appeals to a different line of theoretical reasoning. Specifically, it follows the assumption that 'testing' the effects of MOOCs and OER against the (theoretical) expectations generates the risk that they are considered standalone 'tools' that achieve a particular set of results. In this sense, it risks losing sight of the implicit assumptions inscribed into MOOC platforms and OER repositories, and *people's* engagements with these *materials* that may engender unanticipated practices, values, and ideas (Bayne, 2015; Storme et al., 2016). For instance, rather than making teaching more 'efficient'

and 'enhancing' learning, OER and MOOCs could introduce new managerial regimes that impede teachers' practices, and pressures or anxieties that stifle students' engagements (Castañeda & Selwyn, 2018; Selwyn, 2016). On the other hand, they can also inspire new modes of teaching and learning that are not inherently 'better' or 'worse', 'more effective' or 'detrimental', but that allow students and teachers to engage differently with technology and with each other (Farrow 2017; Knox et al. 2012). In other words, there might be more going on in the roll-out of forms of Open Education than what is intended and 'predicted' through theoretical models, or that can be found through clicking data. As it is the aim of this dissertation to explore the realization of Open Education beyond the scope of its expectations, it reaches out to theoretical repertoires that guide such exploration and give a field of literature to speak with and to.

A socio-material orientation

A growing amount of studies challenged the essentializing and instrumental understandings of educational technologies by adopting a *socio-material orientation* – a research approach that understands phenomena as dynamic arrangements of things and people (Fenwick, 2016; Fenwick & Landri, 2012). The socio-material orientation encompasses various analytical frameworks, but each framework follows the idea that technologies are not merely 'products of' developers that 'afford' users to pursue their pre-existing needs (ibid; Schraube, 2013). For instance, a socio-material orientation does not assume that a phone (only) fulfills the desire to communicate with our distant contacts as intended by the designer: it also manifests new feelings (e.g., phone addictions), new practices (e.g., 'ghosting'), and new 'people' (e.g., the habitual caller, the non-responder) (ibid). Hence, the interest of socio-material research is not so much in the preceding intentions of people but in *relations* between people and things. More specifically, the focus is on locating *what* and *who* in these relations gives rise to new ways of doing (i.e., practices) and being (i.e., intentions, expectations, subjectivities) (see also Law, 2004).

Some frameworks, especially practice studies and Science and Technology Studies (STS), specify their socio-material orientation by focusing on the 'doings'. In the field of educational technology, such studies have illuminated how online learning environments do not just effectuate learning 'on screens' but reconfigure arrangements in classrooms, lecture halls, and other locations (Bolldén, 2016; Sørensen, 2009). This means that they engender new ways of walking around the classroom and thereby make practices more 'fluid' (e.g., new activities 'poor in' through online learning environments) or 'scattered' (e.g., present on the screens of laptops, a projector, and embodied by the teacher at once) (ibid.). Other frameworks specifically put the spotlight on the ways of 'being' engendered through technologies. In the field of MOOCs, this interest has invigorated studies that have foregrounded how teachers become 'hybrid' actors that develop their presence not only by publishing posts, photos, and teaching materials but also through default platform functions (e.g., video play(back), automatic quizzes) (Perrotta et al., 2016; Ross & Collier, 2016). In this sense, these studies show how platforms do not predetermine what it means to be a teacher on a platform, but they definitely shape and delimit possibilities and, accordingly, give rise to new 'identities' (ibid; see also Ross et al., 2014). Differently, the socio-material study of Knox (2016a) focused on how MOOC arrangements give rise to a particular 'self-directed' *learner*. By demonstrating how the material conditions of these platforms shift the responsibility for 'learning' to the individual subject, this research shows how these learners are nevertheless ensnared within performance regimes rather than 'freed' from the restraints of institutions.

What surfaces from these examples is that socio-material studies do not posit 'good' or 'bad' intentions, or even outcomes. Rather, the priority is on locating 'what' and 'who' is 'doing' and 'being', while suspending the judgments about the effects (see also Law, 2004). This focus on disentangling the complexities of practices without prior goals is exactly what allows research with a socio-material orientation to counterbalance 'effectiveness studies' about Open Education. By focusing on distributed agency, it shows how effects are not emerging through one 'thing' or our predetermined motivation to engage with the thing: effects, motivations, and

engagements are made in relation (Bayne, 2015; see also Gorur et al., 2019). Moreover, by locating where exactly people are able to 'act' even within limited arrangements of technologies, socio-material studies are also able to point to the possibilities for people to intervene in dominant structures (see also Postma, 2012; Edwards & Fenwick 2015). A socio-material orientation thus allows lifting Open Education initiatives from their status as 'given' products of a (relatively) small group of developers and policymakers that have effects *on* people. Instead, it 'opens up' entry points that allow (re-)thinking about what kinds of educational arrangements can be made.

Social topology

To tap into the entangled enactment of 'openness', education, and/in Europe, this dissertation deploys a framework within the socio-material orientation that bears a specific sensitivity to space and time: social topology. It is a framework that derives inspiration from the mathematical discipline of topology, a field of studies interested in the intrinsic properties of spatiotemporal forms – those that remain when stretched, folded, or otherwise transformed (Martin & Secor, 2014; Rotman, 2012; Thompson & Cook, 2015). For instance, topology recognizes the same properties in circles, ovals, triangles, and squares (i.a., two-dimensionality, boundedness) and thereby approaches these forms as interchangeable. Not only that, topology considers that these forms constitute possibilities for continuous (i.e., uninterrupted) transformation – as circles, squares, and triangles can be morphed into each other without breaking the lines that constitute them. In contrast, topology assigns *different* properties to linear paths (i.e., an interrupted line), 'peer to peer' networks (i.e., lines that connect all 'nodes' in a network to each other), and 'star-like' networks (i.e., lines that connect through a center) (see Figure 1). That is, as these forms can not result from continuous transformations, they are considered to constitute inherently different relational arrangements (Bott & Tu, 1982; Lury et al., 2012).

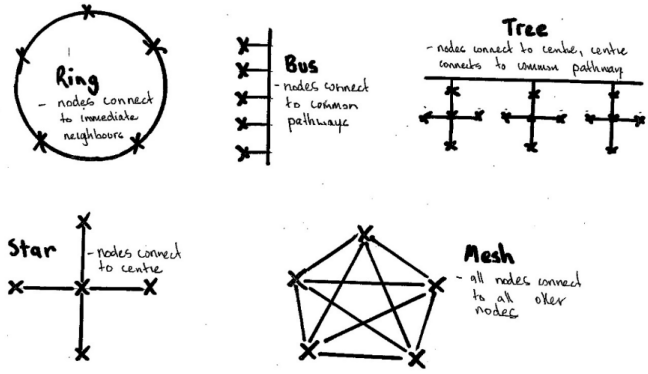


Figure 1. Illustration of different topological forms from Thompson and Cook (2015).

As these possibilities show the inherent assumption of *change* in spatial forms (e.g., circles can fold, expand, or transform otherwise), it shows how topology considers the inseparability of space and time. Next to this, it shows how topology reckons that different and multiple forms of space and time are *(co-)produced* through relational arrangements.

The field of *social* topology has come into being as scholars – especially those in the field of socio-material research – picked up these premises of mathematical topology to invigorate a wider imagination of how relations between people and matter are arranged in different ways (see e.g., Burt, 1980; Law, 1999; Martin & Secor, 2014). A central paper that introduces social topology as a framework for socio-material research is written by Mol and Law (1994). This paper explains how one phenomenon – in their case, a health condition called 'anemia' – can be studied as a complex of multiple forms. Anemia is generally defined as a lack of healthy red blood cells which induces symptoms such as fatigue, shortage of breath, lightheadedness, and cold hands and feet. In this sense, it is a 'disease' situated 'in' a body. In their paper, Mol and Law show how anemia is also situated in, and generates, *regions* (i.e., demarcated topographies). More specifically, these regions are materialized in maps, demographics, reports, and discourses that pinpoint 'where' anemia is more or less prevalent. Next to this, they describe how anemia produces *networks* (i.e., stable

relations across regions) through surveys, methods, and communications to render anemia as a 'standard' diagnosis that can be mapped in those regions. Furthermore, they demonstrate how anemia manifests *fluids* (i.e., relations that change with the environment) because criteria for diagnosis depend on available yardsticks in different regions, which 'flows over' into varying treatments. Each of these forms has different implications – anemia as a region 'fixes' ideas about prevalence, anemia as a network stabilizes diagnoses in different places, while anemia as a fluid engenders differences, messiness, and adaptability. By these exemplifications, the paper of Mol and Law thus shows how social topology allows seeing how one phenomenon not only has multiple meanings but is made up of multiple 'things' and practices too (i.a., a map, a survey, a diagnosis) (see also Law, 2011; Law & Mol, 2001). Moreover, it demonstrates how social topology does not attribute the variations in practices solely to 'culture', a geographical location, or the point in time in which they occur: one 'disease' is enacted in all these different ways within one single hospital. Instead, social topology shows how differences come into being through *how* relationships are established, and *who* and *what* is in- and excluded from those relations (ibid; see also Sheppard, 2002).

The fact that social topology goes beyond the idea that the materialization of a 'thing' or a practice is bound to a location is a reason why it is increasingly picked up in research about digitalization and transnationalization. This concerns studies in, among others, the field of political sciences, cultural studies, and social geography that grapple with the increasing complexities of human-material relations that cannot be 'pinned down' to topographical notions of space and historical descriptions of (cultural) developments (Allen, 2016; Lury et al., 2012; Martin & Secor, 2014). For instance, social topology equips these studies with a way of thinking that allows them to scrutinize how distant ánd proximate policy actors exercise governance in one place (e.g., Europe, national governments, private investors, the city) (ibid). Next to this, it invigorates an understanding of how the ongoing updates of platforms, changing screens, and permeating presence of 'others' through digital messages generate new ways of being 'flexible', of being 'here' and 'there' at the same time (Marres, 2012a; Roth & Jornet, 2018). Moreover, it has previously supported studies to generate an

understanding of how epidemics evolve out of relational arrangements, and produce new spatiotemporal configurations that tend toward 'closures'(e.g., farms shut down, access to medicine is controlled) (Hinchliffe et al., 2013; Michael & Rosengarten, 2012). It has been by following the deployment of social topology across these other fields of disciplines that educational studies have increasingly taken up social topology as a framework too. For instance, before and beyond the increasing presence of digital tools, social topological studies stressed how schools and classrooms are not just 'regions', i.e., topographical locations, but recursive interactions between principals, teachers, pupils, and parents that stretch beyond the school building (McGregor, 2003; Nespor, 1994). But as digital tools and global policies increasingly permeate educational settings, social topology is adopted to scrutinize whether and how this induces changes in the spatiotemporal configurations of schools too. For example, social topological studies have shed light on online distance education and blended courses that rendered the home, the office, 'the screen' and even parking lots into new pedagogical places that are connected to the campus at a distance (Bayne et al., 2014; Maintz, 2008; Sheail, 2018). At the same time, they show how students keep strong attachments to the campus, to face-to-face meetings, and to temporal arrangements of universities – schedules, deadlines, time zones – despite the geographical distance and 'flexibility' of such programs (ibid.). Similarly, studies about (trans)national policies have used social topology to understand the complicated relations between global and regional actors, how they find their ways in local education settings, and how this establishes convergences and differentiations (Heimans, 2012; Landri, 2015; Savage & Lewis, 2018). For instance, such studies have illuminated how the use of 'standards' in European or other international assessments drives schools and teachers toward converging practices within and across countries (Hartong, 2016; Lewis et al., 2016). That is, these standards bind schools together in the same space of 'comparison' that is simultaneously 'global' and 'local' because, or perhaps despite, the fact that these standards are decontextualized – not attached to one local culture or set of values (ibid; Lewis, 2020). At the same time, social topological studies have shown how standards can also perform *differences*. This involves, for instance, studies about censuses and

border management regimes in Europe which use standard indicators for race, ethnicity, and nationality to determine who 'is' European and who is not – which engenders differentiations among people regarding where they can move (Grommé & Ruppert, 2019; M'charek et al., 2014). This attention to change and continuity, in- and exclusion, and similarity and difference, showcases the versatility of social topology and its appropriateness for addressing the research phenomenon and the research questions central to this dissertation. That is, it can tap into the question of how Open Education can include forms of openness and closedness in tandem (Edwards, 2015), how it changes educational relations in terms of scale and scope yet retain some typicalities (cf. Decuypere & Simons, 2016), and enact a European Education Area across different locations (cf. Lawn, 2001). Moreover, its deployment across a variety of disciplines allows seeing whether and how a new phenomenon, like Open Education, takes on the properties of forms of practices previously considered to be 'outside' the field of education.

Conceptual resources

While this dissertation draws on social topology to examine *how* forms of European Open Education are made up, it relies on various conceptual resources to specify *what* actors and relations are relevant to the research problem. The dissertation thereby diverges from 'effectiveness studies' about MOOCs and OER that focus on predefined 'variables', such as attendance, retention, and achievement (e.g., Siemens, 2013). As social topological research exactly intends to go beyond pre-assumed indicators, this dissertation reaches out to concepts that operate as 'sensitivities' that guide our gaze toward particular empirical instances that are relevant to the research problem but without fixing what is (not) being looked at (Law, 2004). In this sense, while each empirical case study conducted for this dissertation has drawn on its own concepts to attune to the specific problems they were dealing with, there were also conceptual resources that recurred as they allowed approaching and bringing together the cases as a topological field (Rabinow & Stavrianakis, 2016).

Infrastructure and architecture

The concept of *infrastructure* is a common thread throughout this dissertation that has provided tangible entry points into studying Open Education initiatives. Infrastructure is generally conceived of as a constellation of materials, such as pipes, road networks, or cables and digital devices that 'enables' interactions across places (Corrall & Pinfield, 2014; Larkin, 2013). However, socio-material studies have propagated the idea that infrastructures consist of dynamic practices that are shaping, and re-shaped by, how people are entangled with(in) these constellations (Bowker & Star, 1991; Star, 1999; Star & Ruhleder, 1996). While infrastructures are often wide in scope and fall into the background of the practices they 'facilitate', the work of Star and colleagues (ibid) has especially invigorated research to direct attention to situations in which infrastructures become visible. For instance, they show how infrastructures manifest through information sheets that prioritize the kind of data that is being documented, shared, and displayed, contact lists that include and exclude particular people, or protocols that standardize how people are expected to act. As these kinds of infrastructures also pertain to Open Education (e.g., people designing software for the platform, data being analyzed), these premises have been an important motivation for continuously steering our gaze toward these situations in which infrastructures surface in our empirical settings (see also Edwards, 2015; Knox, 2016a). More particularly, these instances may exemplify how people and things are connected, in what configurations and over what 'standards', which says something about the values that are brought into being.

Following this line of reasoning that infrastructures are dynamic interactions that (re-)shape practice, multiple studies pointed to the 'topological qualities' of infrastructure, including their extended reach across topographical locations, their implications of in- and exclusions, and their potential to constitute immediate and continuous (ex)changes (Fuller & Goffey, 2012; Harvey, 2012). A particular area of studies has been devoted to the social topological implications of *digital data infrastructures* in education, as these constitute new practices that subtly imply new 'standards' across locations (Gulson & Sellar, 2018; Sellar, 2015). For instance, they

include particular kinds of (digital) assessments, data entry, and data display that are applied to various regions, and thereby conjoin previously unrelated educational sites into 'spaces of measurement, comparison, and ranking' (ibid.). The concept of infrastructure has, therefore, been deployed in social topological studies that scrutinize how educational policies 'travel' – increasingly showing that this does not imply a 'top-down' approach from global spaces to local places but through accelerated digital and online communications across locations (Hartong & Piattoeva, 2019; Lewis et al., 2016). In other words, the social topological understanding of digital data infrastructure stresses how – when it comes to transnational and online phenomena like Open Education in Europe – it is less important to ask questions about whether they are *either* global or local, and where it 'begins' and 'ends' (Williamson, 2016). sInstead, infrastructure is a concept that directs attention to moments and locations in which 'the global' manifests locally, and encourages an interrogation of how the local might 'feed' larger trends in turn. It is in this way that the concept of (digital data) infrastructure guided the focus in the specific case studies while also allowing bringing them together to theorize the field of European Open Education initiatives.

While being entry points to locate who, what, where, and when is involved in the practice of Open Education, infrastructures generally constitute such rapidly moving and changing 'flows' of information that are difficult to sketch out into a particular form other than a continuously changing assemblage (Hartong, 2018; Sellar, 2015). To give a stage to those structures that establish (at least temporarily) particular forms, this dissertation reaches out to the concept of *architecture,* which denotes particular configurations that are 'built' through infrastructures and 'hold together' in a specific way (Helmond, 2015; Plantin et al., 2018). Platforms, for instance, constitute constructions that involve a particular centralization (e.g., applications are brought together), and the ability to 'close off' (e.g., through passwords, proprietary applications) the initially conceived 'open' infrastructure of the Internet (ibid). The ways that architectures are built are visible in policy documents (i.e., what organizations are involved, what is their role) but also through navigational options – materialized through hypertextual elements – which convey particular decisions,

negotiations, and hence, politics (Gorwa, 2019; Knox, 2019; Light et al., 2018). In this vein, the concept of architecture allows seeing how online educational initiatives are made by people, and how they act themselves, as *policy instruments*, i.e., social institutions that arrange relations according to particular ideas (Lascoumes & Le Gales, 2007; Opitz & Tellmann, 2015). In this dissertation, 'architecture' thus constitutes a concept to scrutinize how the 'fluid' and 'contingent' operations of infrastructures are entangled with relatively stable structures of organizations (e.g., European Commission, platforms, institutions) that manifest differential political positions.

Boundaries and bordering practices

Other concepts that continue to guide the work on this dissertation are *boundaries* and *bordering practices*. Initial inspiration came from the notion of the 'boundary object' by Star (2010), which refers to instantiations of infrastructures that allow people across disciplines, communities, and social worlds to work on the 'same thing' without merging or clashing their work. In this sense, *"what is important for boundary objects is how practices structure […] for doing things together"* (Star, 2010, p. 602). One example of a boundary object is a 'repository' – a website through which people from various backgrounds can simultaneously upload, download, maintain, or redesign resources without having to meet each other or having the same background knowledge. It is a small step to relate this to the OER repository, one form of Open Education, but can equally be connected to MOOC platforms in general: they bring together activities and interests of policy actors (e.g., universities, platform providers), developers (e.g., instructors, designers, programmers) and users (e.g., learners, teachers). Starting from this idea, this dissertation draws on Galloway's (2012) conceptualization of the *user interface* as *'a state of "being on the boundary"'* (p. 33) through which he explains how interfaces translate the actions of digital systems into actions of 'users'. That is, the user interface allows a *particular* kind of interaction between a platform and a user, mediated by the 'openings' and 'closings' it manifests. Similarly, Drucker's (2014) notion of the user interface as *"a border zone between cultural systems and human subjects"* by which she emphasizes that the user interface draws on 'ideas' – ideologies, policies,

discourses – and renders them actionable for people. For this dissertation, this engendered the assumption that Open Education initiatives can only be understood through the relations between 'developers', the systems in which they work, and 'users' in their local settings – whereby the user interface establishes a boundary that closes off and opens up, interactions between them.

The concept of 'bordering practices' is introduced to amplify and complement the interest in the 'boundaries' of Open Education. That is, while the notion of the boundary denotes how practices *between* people, things, and systems are structured (cf. supra; but also see Tucker & Goodings, 2014), bordering practices are more broadly defined as relational enactments that drive, direct, and sometimes obstruct movements (Mezzadra & Neilson, 2012; Prince, 2015). It is a concept that is mainly employed in social geography and migration studies to pinpoint mechanisms that control the movement of people and goods, including border control systems, identification regimes, and even housing policies (Burridge et al, 2017; M'charek et al., 2014; Plájás et al., 2019). But bordering practices are also recognized in the structures of online interactions, such as the hyperlinks that direct where one can 'go', or the IP addresses that track and control what content can be seen from what location (Rogers, 2012; Sánchez-Querubín & Rogers, 2018). From a social topological vantage point, bordering practices thus can be seen as relations that orchestrate the *forms* in which relations – online or physical – can take shape (Hartong & Piattoeva, 2019; Thompson & Cook, 2015). It is in this way that bordering practices informed this dissertation to link how movements 'on-screen' are configured to discourses about openness, inclusion, and the ideals of a 'borderless' European Education Area (Lawn, 2001; Robertson, 2011). More specifically, it equipped this study with an idea of how borders around territories could be disrupted, transformed, or emulated through the mechanisms that structure people's movements online – thus manifesting 'openness', education, and Europe in specific, limited ways.

Methods

This dissertation starts from an apparent engagement with, but a lack of consensus about, methods to study websites and platforms (*How can we design , evaluate and theoretically elaborate qualitative research methods in the digital age ? Inaugural lecture KU Leuven, March 21.*, 2018). For instance, some studies have proposed analytic techniques to deal with the multimodal and hypertextual compositions of interface designs, which require other methods than 'static' media such as books, newspapers, and diaries (Adami & Kress, 2014; Drucker, 2013; Lemke, 2002, 2005). Next to this, there are methodological repertoires that focus on the temporalities of websites and platforms, and how 'agile' and 'adaptive' features (possibly) relate to websites in 'archived' modes (Bødker & Brügger, 2018; Brügger, 2009). Furthermore, there are several ethnographical variations that tap into online communities, and how these seep into and/or are affected by 'offline' forms of interaction too (Gallagher et al., 2013; Hine, 2015; Parker Webster & Marques da Silva, 2013). While these existing techniques operate as important springboards for the methods and methodologies that are pursued throughout this dissertation, the goal has been to assemble and attune relevant methods to formulate answers to the particular questions about European Open Education initiatives. This means that, instead of trying to develop 'a' new method, the dissertation explores and tests combinations of methods that allow an understanding of the open, educational, and European character of the studied initiatives. The following sections set out methodological ideas that have been important guidelines for the work on this dissertation, which combine knowledge about concrete techniques with the premises of social topology ánd the conceptual resources stipulated in the previous sections (cf. supra). The first three sections thereby outline ideas that are related to the 'data collection' or, as will be discussed, the engagements with the field of practice. The fourth section elaborates on analytic techniques that are examined in terms of how they bring together heterogeneous insights gained from these engagements.

On user interfaces: Active navigations

The social topological interest in the way that things and people relate to each other attracted particular attention to the enactment of Open Education initiatives *on* user interfaces. The main consideration is that websites and platforms appear as collections of (hyper)texts, images, and videos that – in their particular relational order – establish *forms* (Decuypere, 2016; Drucker, 2014). For instance, the sequence through which hyperlinks are connected, the images that are attached to those hyperlinks, and the options for 'navigating' the online environment that are hereby installed manifest what a user is expected and able to 'be' and 'do' (Light et al., 2018). Differently, forums and newsfeeds render visible traces of 'who' (i.e., which profile) said 'what' and 'where' (i.e., which post') as well as 'when' (see 'timestamps') (Beaulieu & Simakova, 2006; Venturini, 2012). Following this line of thinking, Latour and colleagues (2012) argue that navigating on-screen manifests how people are brought together with *things* such as buttons, symbols, texts, and maps. In a similar vein, navigations on user interfaces are considered to bring people into new configurations that perform new forms of being together and, hence, new *topological* spaces and times that are generally conceived as online 'environments', 'communities', or 'updated feeds' (Cothey et al., 2006; November et al., 2010; Rogers, 2012). These arguments informed the 'navigation' as a method that implied that the researcher scrutinized the user interface by 'following' hypertexts, and documenting these movements through screen recordings, voice memos, and/or written notes. The navigation is explicitly characterized 'active' to indicate that the navigation did not imply interactions with other users but this did not imply a 'passive' way of attending MOOCs (Knox, 2016b). Rather, it is a particular kind of activity in which the *reactive* way of going about on a user interface (e.g., following up on prompts, and notifications) is combined with *proactive* anticipations of what enables and delimits these 'doings'. These navigations are recorded through video screen capture and/or through (voice) memos that narrate these navigations (e.g., what made me click like this, what are other options that can be tried out). In this way, the intention is to leverage the 'first-person perspective' of the researcher *as* a user while analyzing, and thus decentering, how this user is brought

into being through the technology of the user interface (Schraube, 2013). At the same time, there has been an awareness that the user interface only gives a partial view of the relations and, hence, the social topological forms that make up Open Education initiatives. For this reason, the method is combined with other techniques that, depending on the research problem and the practical possibilities of the studied initiatives, go 'beyond' what is visible on the user interface and/or scrutinize what happens 'with' user interfaces in educational settings.

Beyond user interfaces: Interviews, observations, and document analysis

The next set of methods is informed by the argument that, to understand the relational arrangements of websites and platforms, it is important to scrutinize the political, economic, as well as educational interests and decisions that go into *making* them (Knox, 2018; Lynch, 2015). This involves the social-technological infrastructures and architectures which, from a social topological perspective, can be approached as different 'layers' of work *beyond user interfaces* (see also Bratton, 2015). To devise methods that tap into this work, inspiration is gained from the 'ethnography of infrastructure' which points to several characteristics (i.a., conventions, standards, and breakdowns) of infrastructural work and how it can be recognized (Star, 1999). These characteristics have been central foci in interviews and observation techniques which, in turn, are based on other ethnographic studies that show how to elicit daily performances and ways of speaking among platform staff that manifest pivotal values, norms, and routines that feed into the design of platforms (Landri, 2013; Seaver, 2017). Next to this, studies that used document analyses to scrutinize infrastructures are followed to consider how these can manifest political negotiations that further shape these decisions (Lewis et al., 2016; Williamson, 2018b). In short, these methods – interviews, observations, and document analyses related to the work of staff – are used to trace the work that goes into making Open Education appear 'on' user interfaces. The intention is thereby to lift Open Education initiatives from their 'taken-for-granted' status and to consider them as ongoing effects of decisions, negotiations, and contingencies that can be interfered and, hence, that can be changed too.

With user interfaces: Online and on-site fieldwork

The third set of methods that is deployed in this dissertation is based on the social topological premise that platforms and websites manifest themselves differently across settings, dependent upon local infrastructures, personal adaptations, and (other) contingencies (Bayne et al., 2014; Sheail, 2018). In other words, these methods are devised to understand how educational actors – students, teachers, and administrators – interact *with user interfaces* in their local settings, and how this gives rise to different social topological forms. These methods are particularly inspired by ethnographic approaches that aim to understand how teachers and learners in online programs organize their 'space' and 'time' – including how they 'fit' educational tasks into their schedules, what devices they need and use, and in what locations (Enriquez, 2013; Ferreira & Lemgruber, 2019; Oliver, 2015). To get a grasp of these specificities, these studies tend to draw on 'traditional' techniques of interviewing, but attune and complement these with methods that allow surfacing the daily details that might otherwise be left unnoticed (see also Ruppert, Law, & Savage, 2013). The case studies in this dissertation integrate these ideas into different forms of online and on-site fieldwork. The former involves formal interviews with students via conference calls as well as active participation in online meetings in which students partake. The latter comprises (group) interviews with students about their habits regarding how they organize their 'place' and 'time' and/or diaries to sketch out a weekly routine. The insights gained from these empirical engagements allow seeing the *different* socio-material conditions across locations that, together or in contrast with the user interface design, shape how learning and teaching with online education initiatives occurs in multifarious ways.

Analysis: Four steps

The insights gained from engaging with practices 'on', 'beyond', and 'with' user interfaces are brought together through a range of different analytic techniques. Based on the social topological interest of this dissertation, the purpose of these analyses is to reconstruct how these different practices – situated across these dispersed locations –

'hold together' as coherent *forms* (cf. Mol & Law, 1994). More specifically, the intention is to surface those relational forms that are produced by the Open Education initiatives that are being studied. While the techniques vary across the empirical case studies based on the conceptual resources that are being picked up, they are devised to pursue four consistent steps. These steps entail *illuminating* movements and situations in the data based on the relevant concepts, *describing* these movements and situations in detail, *visualizing* how these manifest social topological forms, and *typifying* the social topological forms based on broader theoretical ideas. These steps are inspired by, and hence, resonate with the analytical methods of initial, axial, and theoretical coding in constructivist Ground Theory (Charmaz, 2014). However, there are important ways in which the social topological premises of this dissertation have been adopted to attune these methods to the interest in describing, rather than explaining (cf. Grounded Theory), Open Education initiatives in Europe.

First, similar to constructivist Grounded Theory, the social topological premises inspire the deployment of concepts as sensitivities rather than predetermined 'codes' (cf. Charmaz, 2014). Initially, socio-material studies inspired the use of concepts "as a means of analytical entrée and provisional theorizing" (see Clarke and Star, 2008, p. 118, see also Chapter 4). Next to this, exemplary social topological studies are followed which use concepts to single out movements and changes on the one hand, and temporary stable situations on the other hand (Gulson et al., 2017). However in general, to remain attentive to relations that may interweave and evolve from these movements and situations, social topological studies generally suspend attaching concepts to 'theorize' them. In this regard, this dissertation deploys conceptual resources to *illuminate* relations and practices that are relevant to the research problem without adding 'codes'. Second, and relatedly, the practice of coding is purposefully eschewed more generally based on the consideration that codes operate as 'extrinsic measures' and thereby trouble the social topological interest in the intrinsic relational arrangements of phenomena (Lury et al., 2012; Martin & Secor, 2014). Other social topological studies exemplified how, instead of coding, *descriptions* of movements and situations allow fleshing out their spatiotemporal specificities – for

instance, whether manifest (de)centered, (a)synchronously, and/or through (inter)connections (Ceulemans et al., 2014; Decuypere & Simons, 2016; Sørensen, 2009; Thompson & Cook, 2015). In this dissertation, descriptions are specifically used to bring together insights gained from moving 'on', 'beyond', and 'with' the user interface. Descriptions, in this respect, are purposed as analytic endeavors of staging *who* and *what* is involved in the empirical settings, and how these people and things are related to each other across their different locations. Moreover, these descriptions are used to give an account of how I, as a researcher, *made* the data through the intervention of the research (Ceulemans et al., 2014; Law, 2004). The third step, which involves *visualizations*, is situated in the middle of the analytic practices – a moment at which studies in other qualitative paradigms may use data displays, code diagrams, or other visual means to get an overview of the complex data (Charmaz, 2014; Ravitch & Mittenfelner Carl, 2021). The visualizations for this dissertation are inspired by social topological studies that draw on network analyses, sketches, or complex knots to render relational arrangements under study more explicit (Decuypere & Simons, 2016). Based on a review of graphic forms (Verstockt, 1982), and particularly inspired by the sketches of 'the border' by Thomas Nail (2016), this dissertation consistently draws on circles to experiment with different ways to present boundaries and bordering practices. That is, circles are among the different geometrical forms that manifest a typical 'bounded surface' and, hence, constitute a 'boundary'. Moreover, their constant radius distracts the least from questions about Euclidean distance (see Verstockt, 1982). Through methodological explorations, various ways in which circles can transform are being analyzed, as well as how they constitute different forms through lines and other surfaces that penetrate, centralize, and jumble into multiple overlaps. The fourth and final step is that of invoking *typicalities*. These typicalities manifest the social topological interest in (re-)conceptualizing spatiotemporal properties of movements and situations (cf. supra). For example, it is concerned with whether these relations are bounded, porous, stable, dynamic, dispersed, or centralized. In tandem, a broader range of literature is invoked to explore where and when, in what other situations, *the same* relational properties appear (see Decuypere &

Simons, 2016). For instance, relations that are typified as 'centralized' situations can be related to educational studies that accordingly characterize how blackboards in classrooms generate a common 'central' attention (Sørensen, 2009). At the same time, these relations can be related to platform studies that point to the ways that platforms (re)centralize dispersed practices (e.g., of data collection, of different navigations) (Helmond, 2015). By appealing to movements and situations across different fields of study, typifications allow dealing with the variety of actors, relations, and interests involved in making a new field such as Open Education initiatives, and how these are assembled in practice. In other words, it is a way of *theorizing* that renders visible how different cases hold together as a new 'topological field' (see Rabinow & Stavrianakis, 2016).

The following chapters display how the theoretical premises, conceptual resources, and methods have (been) brought together through and in empirical cases. More specifically, they show how a wide variety of disciplines has been invoked to make sense of the empirical case studies, ranging from educational theory to political sciences, from 'ethnographies of infrastructure' to Critical Border Studies, and from (post-)modern philosophy to new media theories. Engaging with these different fields of literature did not only allow showing how Open Education relates to different disciplines but also how each empirical case study can be understood in light of recent developments. This means that, by making references to recent trends in the literature, the chapters follow and document how the Open Education initiatives changed together with new European policies regarding 'digital platforms', with crises about and around the European borders, and with hypes and concerns around 'Learning Analytics'.

Chapter 3: The EMMA platform - a multiplex of boundaries[1]

Massive Open Online Courses (MOOCs) are among the various educational technologies that received a lot of attention over the last decade and that – because of their free and online availability – are framed as a threat as well as an extension to formal higher education (HE) (Farrow, 2017; Weller, 2014). Discussions about their 'open' nature grew as different kinds of MOOCs appeared, ranging from community-based courses to 'broadcasted' lecture series, and from publicly funded initiatives to commercial *freemium* packages (Decuypere, 2018; Knox, 2016a). In these discussions, 'openness' is repeatedly used as a spatial and temporal metaphor to grasp the proclaimed potential of MOOCs to alleviate barriers to education. On one side of these discussions are scholars that link openness to the ambition to 'open the doors' towards educational institutions, especially for those otherwise excluded from them (Weller, 2014). Digital devices are thereby positioned as flexible tools to counter the fixed structure of 'brick-and-mortar' and time-scheduled institutions. Another side of the debate relates openness to the capacity of digital devices to let knowledge 'travel' through geographically unlimited networks of peers (Peters, 2014). Early initiators of MOOCs especially adhere to this latter interpretation, as they associate openness with the possibility to expand and accelerate knowledge exchanges over the Internet while leaving room for local or personal adaptation of the subject matter (Cormier, 2008; Downes, 2007). Despite these different interpretations of openness, studies on MOOCs generally do not formulate clear conceptual or operational descriptions of what openness implies for their research (Weller et al., 2018). Without explicating these descriptions, however, practitioners and researchers in the field of HE do not

[1] This chapter is an adapted version of the following publication:
van de Oudeweetering, K., & Decuypere, M. (2019). Understanding openness through (in) visible platform boundaries: a topological study on MOOCs as multiplexes of spaces and times. *International Journal of Educational Technology in Higher Education*, 16(28), 1-30. https://doi.org/10.1186/s41239-019-0154-1

have the means to evaluate how the proclaimed open nature of MOOCs is and can be realized in practice.

Being explicit about the realization of openness is also important for acknowledging the boundaries and closures that – as also noted in the scholarly field – continue to mark Open Education. For example, studies emphasized that online communities in MOOCs have a shared interest that binds them together but that, on the flip side, makes them 'closed off' from those with different views (Funes & Mackness, 2018). Moreover, studies showed that MOOC platforms generally start from the ideal of 'free' access but that little attention is paid to the inclusive nature of their practices (Bayne et al., 2015; Knox, 2013a). These nuanced interpretations of openness invite us to, instead of assuming complete openness, scrutinize *where* and *when* openness is enacted, as well as *where* and *when* boundaries are crossed (Edwards, 2015; Oliver, 2015). This engagement is not a straightforward effort, as online education brings together various people, in dispersed locations and at various moments in time - including learners, teachers, and institutions (Bayne et al., 2014; Crea & Sparnon, 2017; Knox, 2016a). Hence, MOOCs should be understood as entanglements of multiple spaces and times.

This chapter aims to respond to the lacking conceptual and operational descriptions of openness in research on MOOCs through an empirical case study. It adopts a specific view of openness that integrates an interest in space and time, and thereby diverts from existing conceptions of openness in several ways. First, different from other studies, it does not aim to conceptualize, operationalize or assess openness through one or multiple separate dimensions. That is, it does not consider openness merely in terms of access nor does it divide the legal, technical, or ideological aspects of openness (Ioannou, 2018; Stracke, 2018). Instead, this study intends to overcome compartmentalized notions and to comprehend how openness is enacted through multiple forms that interact. Second, the study does not assume that openness is realized by removing barriers (e.g., Baker, 2017). In contrast, the study follows the understanding that openness arises out of practices that necessarily install boundaries in order to construct specific spaces and times. By adopting this alternative view in an

analysis of one particular MOOC platform, this chapter aims to give an overview of the potential contributions that this view might yield for further research and practice regarding MOOCs. The first part of this chapter thereby sets out the central premises of the theoretical and methodological approach that grounds this view, social topology, an approach that is gaining increasing interest in educational research. Then, the chapter introduces a topological conceptualization of openness that sketches how openness is understood in relation to what is made visible and invisible. Based on these ideas, it is argued that openness can best be understood by focusing on boundaries that distinguish between what is seen and what is not seen. Then, it is explicated how these arguments inform the methodology of the empirical study that this chapter reports upon. Specifically, the data collection and analysis focus on the distinction and relation between the practices visible *on* the user interface and the 'invisible' infrastructures *beyond* this interface. Structured by this dual focus on 'on-interface' practices and 'beyond-interface' practices, the reported findings describe how multiplexes (i.e. multiple interconnected forms) of spaces and times are produced through boundaries that make certain practices either visible or invisible, with a particular interest in how this establishes openness.

Conceptual framework

Social topology

In everyday life, space and time are usually indicated through external measures, such as topographical maps, clocks, and calendars. However, not all phenomena can just as easily be 'located' through these measures. This is equally the case for online platforms, as they cannot be fixed to a particular place, nor can they be related to a stable beginning or end time. Social topology as a theoretical and methodological approach aims to understand these spaces and times through the relations that they bring into being (Martin & Secor, 2014; Mol & Law, 1994). That is, social topology recognizes spaces and times as composites of relations that are made manifest through practices. A topology, then, is a set of practices that produces spaces-times (e.g., Mezzadra &

Neilson, 2012). Social topology thereby considers space and time as dependent on each other too. This becomes apparent in the often-cited example of 'time-space compression', which points to the way that accelerated communication technologies (i.a., telephone, digital text messages) make distant entities come 'near' which, in turn, intensifies time (Harvey, 1989). As shown in this example, social topology highlights how these complexes of spaces-times are not pre-existing 'containers' or merely mental constructs. Instead, it shows how they are produced through concrete practices (Kidd, 2013; Tucker & Goodings, 2014).

Social topology is inspired by the premises of topology, a sub-field in mathematics that examines relations that take form as figures, such as circles, cubes, or manifolds. It is thereby specifically interested in how they can transform while holding their relations intact. For example, a circle transforms into a square without disrupting the intrinsic relations or lines that build up the figure. Introducing a line that separates the figure, however, engenders a new and different form. Because this form is understood as a *topological space-time,* this means that topological spaces are established through figures that twist, fold, or extend without breaking (Sha, 2012). Social topology largely adopts these premises of mathematical topology and approaches settings or objects as figures that make the continuous relations that constitute topologies apparent (Lash, 2012; Martin & Secor, 2014). One of these premises is to identify the intrinsic properties of relational arrangements, and what are the values inherent to those arrangements (Decuypere & Simons, 2016). For instance, a 'star-like' network that connects relations to a center invokes a different practice, based on different ideas about how one 'should' relate to each other, than a distributed network that connects to various centers, or a sequenced line of interactions (Thompson & Cook, 2015). In this vein, social topology allows recognition of how practices invoke imaginaries – normative views that cohere with values and desires for the future (Jasanoff, 2015). Social topology can therefore serve to examine, through empirical accounts, how practices are related to ideas about what education is or should be. In this way, the approach can equally help to trace what and who produces these norms, and how these norms have become stabilized (Lash, 2012; Marres, 2012a). A second premise that

social topology brings into being is the consideration multiple relations are present within one setting, and thereby produce overlapping and intersecting topologies (Mol & Law, 1994). This also means that different spatiotemporal forms co-exist in a platform, for instance, as it can integrate a center, a set of distributed relations, and a sequence at the same time. This shows how social topology can help to develop a characterization of openness without ignoring the normative nature of its materialization, and thereby equally allows an engagement with how openness can be envisioned otherwise in multiple forms (Martin & Kamberelis, 2013; Thompson & Cook, 2015).

As social topology grasps the multiplicities and complexities of relations, it is particularly suitable for studying the realization of openness through MOOCs. For example, social topology allows consideration of the complex amalgams of family arrangements, travel, and work that shape how online education is being 'done' (Sheail, 2018). Moreover, a social topological approach is able to acknowledge how platforms generate continuously changing configurations of relations that counter the predominant idea of space 'fixed' on a map (e.g., November et al., 2010). Social topology, however, does not merely address practices that are immediately visible to learners on user interfaces but also acknowledges the 'hidden' infrastructures that are implied in the interface designs (Edwards, 2015; Kitchin & Dodge, 2011; Knox, 2016a; Parisi, 2012). In order to understand spatiotemporal configurations of platforms, and their openness, social topology thus also moves 'beyond' the user interface.

The 'Open', the visible, and its boundaries

The importance of visible and invisible practices for a topological understanding of openness is addressed by Deleuze (1988), as he equates 'the Open' to 'the visible'. More specifically, he thereby relates what is *seen* to what is openly imaginable. For example, when one thinks of school, these ideas are mainly built on the visual encounter with a school, its architecture, its learning and teaching materials, and its time schedules. While texts and words can describe these imaginaries, Deleuze

highlights how a textual description only acts on the visible. Hence, visible entities have a particular quality to establish conditions as well as set limits to what we have words for, while language builds relations between and with visible entities. This intricate relation between language and vision "is why the Visible or the Open does not give us something to see without also providing something to speak" (Deleuze, 1988, p. 111). Following this argument, what is visible (on user interfaces) does not only delimit but also produce what and how we imagine, i.e., imaginaries. What is closed off from visibility is positioned beyond the boundary of imaginaries and thus, 'outside' of our norms about thought. This conceptualization of openness thus sets out an understanding of boundaries as constructions that shape our collective imaginaries (see also Burridge et al., 2017; Mezzadra & Neilson, 2012; Thompson & Cook, 2015). While boundaries are thereby considered to delineate and produce visibilities, they can also mediate between different visible localities (Star, 2010; Star & Griesemer, 1989). An online platform, for example, sets boundaries for what users can see (e.g., front-end interface, immediate 'user environment') and what producers can see (e.g., back-end work). However, the platform also mediates their visibility, as it performs their mutual and interactive presence 'on the boundary' (e.g., users see the website as created by producers; producers see data of users' navigations). In this sense, the user interface can be considered to establish forms of 'openness' *through boundaries* that mediate between localities otherwise closed off to each other. This means that openness should be considered not by the absence of boundaries but by particular workings of boundaries, in terms of what they open up for, what they close off, and thus how they connect different localities.

The examined figure and the topological methodology

The platform that is studied for this chapter, and thus the topological 'figure' of this study, is the *European Multiple MOOC Aggregator* (EMMA). EMMA is administered by several European universities and financially supported as a pilot project by the Competitiveness and Innovation Framework Programme (CIP) of the European Commission (EC). In their publications, initiators of EMMA relate to four explicit

accounts of openness. That is, openness in EMMA is related to (1) *access* to free and CC-licensed course content, (2) learning in *networks* of peers, (3) learning across *European* national boundaries, including multilingual content of different European institutions, and (4) experimentation and research through *data* in a personal learning environment (PLE) (Kerr & Eradze, 2016; Kerr & Merciai, 2015). The methodology for this study is developed to closely align with the topological conceptualization of openness and its relation to visibility and boundaries. Understanding boundaries as mediations between localities invisible to one another (Star, 2010), the user interface of EMMA is approached as a boundary. More specifically, it is a boundary that mediates and renders the presence of different localities – of users and producers – in a particular way. that Interested in its workings, the study aims to move and situate itself *on* and *beyond* this boundary (cf., Mezzadra & Neilson, 2012). Along these lines, a distinction between *on-interface* practices (i.e., visible for website visitors) and *beyond-interface practices* (i.e., visible in professional work on EMMA) guided the methodology of the study.

To examine on-interface practices of EMMA, data were collected through *active navigations* of the platform. This means that the researcher, for about four weeks, visited the EMMA website, and carefully examined the homepage, informational pages, registration procedures, and 6 MOOCs of different universities. This was documented through video screen recordings and written reflections. Because the funding and production of EMMA were paused at the time of the navigation, all MOOCs on EMMA were 'archived'. Hence, interactions between learners were only examined as documented, rather than 'live'. After the navigations, the researcher conducted interviews with EMMA team members, all involved in the development and maintenance of the platform. These interviews served to examine 'beyond-interface' practices and covered their daily infrastructural work on EMMA, and depending on the role of the interviewee in EMMAs development, the educational philosophy and the collaboration with the EC. The interviews were recorded, transcribed, and complemented with notes. Valuing a dialogic stance towards ethics, the researcher

asked consent through a consent form but also checked in with participants' questions, concerns, and comments throughout the research, including multiple member checks.

Data that resulted from the navigation and interviews were brought together and analyzed inductively while connecting them to the four accounts on openness proclaimed by EMMAs initiators. This meant that multiple topologies were reconstructed and categorized as *network, access, European,* and *data topologies.* The subsequent sections of the chapter introduce descriptions of these topologies and how they were made up of on-interface practices and beyond-interface practices. Next to these descriptions, the following sections include sketches that present how the described practices manifest relational forms. These sketches are based on circles – bounded forms that hold continuous distances – which present the boundaries 'around' the figure of EMMA without distracting toward questions about geographical distance. The circles are combined with other geometrical shapes (i.a., lines, dots, squares) to show the specificities and typicalities of the forms. Moreover, they are presented together with captions that elaborate on the specificities of different relational arrangements. While the following sections are unable to cover *all* practices that make up the platform, the combination of descriptions, sketches, and legends are thereby employed to engender a versatile presentation of the specific spaces and times operating in the figure of EMMA.

Network topologies

By referring to networked learning (Kerr & Eradze, 2016), initiators of EMMA relate to the spatiotemporal conception that online networks in MOOCs connect geographically dispersed individuals (e.g., Downes, 2007). In the figure of EMMA, network topologies indeed appear to connect individuals, but they do not connect anything, anyone, anytime, and anywhere. Instead, they introduce specific relational arrangements that make particular connections possible.

On-interface practices: Attachments

On the EMMA interface, connections between learners and teachers are realized on (parts of) pages introduced as 'Conversations' (i.e., text boxes with comments and replies), 'EMMA posts' (i.e., full pages for posts and replies), and 'virtual classrooms' (i.e., pages attached to specific MOOCs). Furthermore, there are hyperlinks to dedicated Twitter and Facebook pages through which learners interact. These pages and links follow the same structure of delineated comment- and reply boxes, and each post is attached to a name, photo, and a 'timestamp' of the date at which the post is made. While these pages thus generate interactions, they also segment and individualize contributions – disallowing learners to work on and/or mix each others' contributions collectively – thereby not operating as a boundary that is shared (cf., Star, 2010). These relations generate network topologies that allow attaching pieces of information while retaining fragmentation (Figure 2).

At the same time, the timespans attached to the posts give expression to a chronological, linear ordering of the posts. Moreover, they show how interactions have increased in particular periods and on particular pages, specifically those of pages and courses that are announced to be 'active' and closing soon. Hence, even while the MOOCs are 'archived', these dates mark the enactment of *spatiotemporal boundaries,* such as those moments of coming together for a test that are typical to many school formations (Bødker & Brügger, 2018; Leaton Gray, 2017).

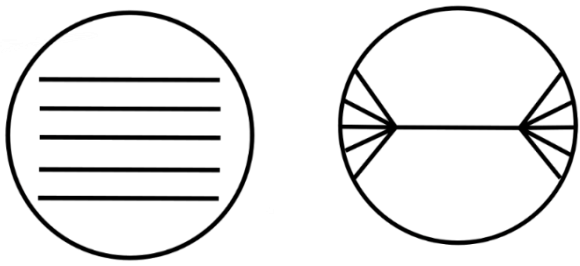


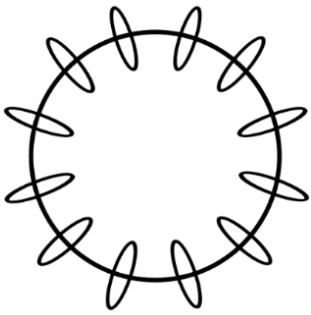
Figure 2 (left). The horizontal lines present the fragmented contributions of learners attached 'on' EMMA. **Figure 3 (right).** The diagonal lines show how teachers and students are separate, the horizontal line presents how they come together on the interaction pages.

These relations thus establish a network of co-presence, in which not only materials but also people are simultaneously attached to each other (Figure 3).

Beyond-interface practices: On the same page(s)

Moving beyond the interface showed that the development of the platform was dependent on a network of relations among the EMMA team, universities (i.e., providers), partnering organizations (i.e., partners), and the EC as the funding institution. The daily responsibility of the EMMA team was to maintain these relations and negotiate their interests – which ranged from data analytics procedures to educational interests. This required a form of *hybrid knowledge,* i.e., connecting and moving back-and-forth between the particular insights and jargon of each of the actors (Callon et al., 2009; Star & Ruhleder, 1996). For example, team members shared how they wanted to translate educational ideas into digital tools with the programmers who, in turn, used their programming language to integrate these ideas into the software of the platform. On their end, MOOC instructors learned about the technological possibilities of the platform while developing their MOOCs based on their subject matter knowledge. This means that team members were continuously working on boundaries as their *common interest* in the platform, i.e., their shared tool and, hence, their shared 'boundary' held their practice together (Star, 2010; Star & Griesemer, 1989) (Figure 4). These networks were not only held together by their common interests but also through particular tools. One tool was the 'Gantt chart', a timeline structured by 'work packages' (i.e., clusters of tasks) and 'deliverables' (i.e., planned outcomes of the work packages) that presented to the partners, and to a wider audience, a timeline through which the platform was developed. Next to this, software tools for project management, file sharing, telecommunication, and slide presentation were used, allowing fragmented bits of work to be shared and held together. As one of the team members noted, these tools allowed partners to be 'on the same page'. In other words, similar to the establishment of release- and closing dates on the interface, these beyond-interface practices allowed people to come together 'in' work packages, in tasks, and within working files. While these tools separated the orderly 'timeline'

presented to a wider audience and the meshes of work in the project management software, these relations performed boundaries between who was working 'in' the platform and who was merely 'on' the platform (Latour 1986; Star 1999; Figure 5).



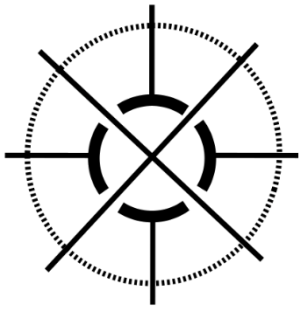


Figure 4 (left). The rings present how each actor contributes with hybrid knowledge, establishing and contributing their own ideas to the collective boundary. **Figure 5 (right).** The porous circle indicates how a transparent boundary is established through the Gantt chart, while the inner circle with four 'gaps' presents the selecting visibility and connectivity established through the project management software.

Access topologies

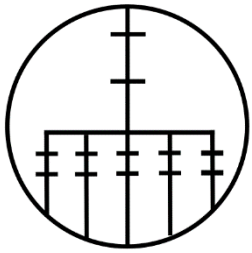
Reflecting the broader discussions on MOOCs, initiators of EMMA relate openness to the ubiquitous, free-of-cost, and creative commons-licensed nature of its learning content (Kerr & Eradze, 2016). This analysis, however, focuses on access established *through* the platform and not only *to* the content. More particularly, access seems to conflate with networks of attachments that mediate interactions through the boundaries.

On-interface practices: Passing through the school infrastructure

On the interface of EMMA, the URL to the homepage operates as the first access point, an 'outer boundary' that defines where the platform starts and ends (cf., Star, 1999). The homepage shows a photo of three young individuals holding digital devices, combined with the motto 'MOOC different!'. This text renders EMMA as 'different' from 'others', a position that enables a distinct identity based on the characteristics of

the people in the image (Srinivasan, 2017). This combination of text and image thus establishes a selective imaginary, where EMMA provides entrance to a targeted group of learners. Access continues through registration, a required procedure to become a learner that inquires personal information through a form with preformatted text boxes (i.a., names, email addresses, birth dates, spoken languages, geographic locations, and optionally gender and professions). Moreover, the forms ask for consent with the terms and conditions regarding data collection and rules about behavior on the platform. Registration thus sets preconditions for being 'in' EMMA and opens up access only if and after the learner is willing to 'open' themselves up to the platform (Decuypere, 2018). These relations thereby establish selective access topologies, whereby boundaries do not only mediate but also shape who accesses EMMA.

After registration, a compilation of hypertextual images depicts titles of MOOCs, their release dates, and names of providing universities. While hovering over the images, teachers' names and brief introductory texts appear. By granting partial insight into MOOCs, these hypertextual images manifest 'windows' into different classrooms. Through a click, and a subsequent 'enroll' button, the navigation continues to lessons and units that can be followed through 'next' and 'previous' buttons. By these means, hyperlinks enact boundaries similar to walls and time schedules in a *traditional school,* as they guide a sequential path *through* an entrance, *through* classrooms, and *through* a series of lectures (Figure 6). At the same time, there are hyperlinks that follow a less sequential order. For example, links to learning materials and assignments often lead to external websites or software programs, and there is a separate link to a 'coursebook' on the personal learning environment (PLE). The combination of sequential and dispersed connections marks the digital arrangements, whereby continuities with 'schools' are combined with the flickering presence of webpages (Hassan, 2017; Leaton Gray, 2017). The spatiotemporal formation of learning within this topology is characterized by breaks, turns, and 'blind alleys' which form relations like a maze (Figure 7).



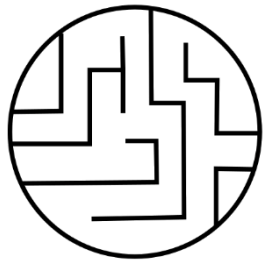


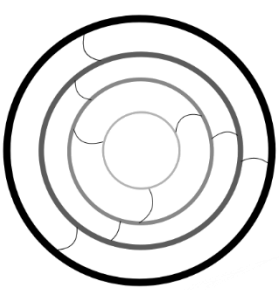
Figure 6 (left). The vertical lines illustrate the access 'through' the platform, including multiple paths to different courses, and the short horizontal lines indicate the clicks on hyperlinks that generate access 'to' content. **Figure 7 (right).** The lines indicate the various directions through which movements are made, presented through a 'maze' contained in the bounded figure of the platform.

Beyond-interface practices: Hosts and backend access

Beyond the interface, access is enacted through a wide range of practices that make up the infrastructure. While these practices are generally not directly visible on the user interface, the operations of the web server became apparent especially at the moment it 'broke down' (see Star, 1999). Second, the webserver manifested in a relatively long loading time for webpages once its size was reduced again. These operations stage the web server as a host that performs access through EMMA while it also enacts the imaginary of a *mutable space* – often connected to digital technologies – as it forms EMMA in different sizes and speeds (Harvey, 2012; Ruppert, 2012). The web server's operations, therefore, do not change the relations that make up the spaces and times of EMMA, yet it makes the figure of EMMA appear in a continuously stretching and shrinking form (Figure 8).

The 'backend' constitutes another way to access the platform – a part of the user interface that is only visible to instructors and staff of EMMA. Through this backend, teachers and staff posted in the 'Conversations', 'EMMA posts', and 'virtual classrooms' (see Network topologies) with a personal photo. In this way, they established their presence *on* the user interface and connected with learners. Next to this, the backend encompasses a notification (cf. 'dashboard') that shows questions and comments of learners within a single pane instead of scattered over multiple pages.

These relations show how, while teachers 'mingle' with learners through their co-presence on the interface, the backend generates a centralizing set of relations that fit with the idea of a one-to-many relationship between teachers and learners (Figure 9).



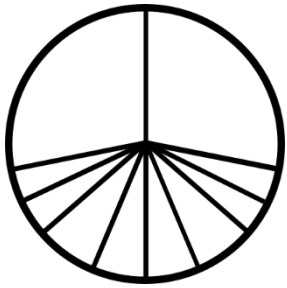


Figure 8 (left). The different circles illustrate how the platform shrinks and expands, and the short lines in between present the operations of the webserver – 'pushing' or 'pulling' into a new size. **Figure 9 (right)**. The vertical line presents access to the backend, the diagonal lines indicate how learners are centralized through this backend.

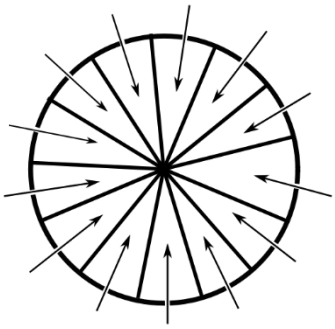
European topologies

While EMMA explicitly aims to transgress European national borders through its online delivery and multilingual content, this position equally substantiates the existence of boundaries that mark European *territories,* i.e., the geographic regions claimed by the legislative power of nation-states or the EU (Burridge et al., 2017). Hence, EMMAs narrative presents a complex interweaving of digital and territorial spaces. At the same time, the translated content mediates between these various localities.

On-interface practices: Territories on screen

On the EMMA interface, there are various references to Europe. For example, the homepage and the introductory videos show an image of the European flag, and outgoing hyperlinks to proclaimed 'Related initiatives' lead to websites or platforms released under EU support. This designates how the platform is positioned in a European field of online education in which (platforms of) Member States are bound

together, and separated from 'outside' countries (cf., Büttner et al., 2015). At the same time, some learners show the presence of regions beyond the European Union, for instance, by posting pictures that exemplify a local phenomenon (e.g., 'This is a wine cellar in our region') in the 'Conversations' boxes. This shows the porosities of these regional boundaries when manifested on the platform, as learners *slip through* them and thereby bring spaces 'inside' EMMA that are initially excluded from the European imaginary (Burridge et al., 2017; Mol & Law, 1994; Figure 10).



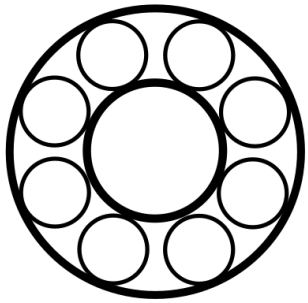


Figure 10 (left). The lines within the circle show how different countries are held together within the bounded figure of EMMA, its outer boundaries illustrating how it excludes an 'outside', while the arrows show how learners are able to slip through those outer boundaries. **Figure 11 (right).** The smaller circles present the selection of 'home countries' that are included through the translation system of EMMA, while the inner circle presents how the English language operates as a space 'in between'.

Other practices on the user interface generate boundaries within Europe. For example, the 'Home page' integrates a pictogram of a flag with a text button 'Language', which leads to a drop-down menu to select one of the nine available languages on the platform. The combination of this image and text reinforces the association between languages and regions (viz., Catalan is included as a regional language), while the selective range of languages additionally shows how the platform includes as well as excludes specific regions in the European imaginary (Opitz & Tellmann, 2015). Moreover, the translation system that supports multilingual content sets a default language based on the IP address of learners and it does not translate learners'

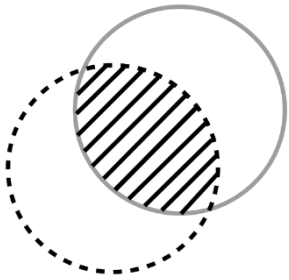
comments and replies, which leads the 'Conversations' to continue in learners regional language mainly. In other words, this translation system enacts linguistic boundaries that enact learners' 'home country' which stands in contrast with EMMAs objective to traverse European boundaries through the multilingual content. While all content is published (at least) in English on separate pages, and 'Conversations' *can* continue in this language, this 'lingua franca' enact a space 'in between' that connects the linguistically bounded spaces and brings them closer together (Prince, 2015; see Figure 11). In this sense, the combination of selective inclusion, the prioritization of the 'home country', and the enactment of spaces 'in between' establishes an ambiguous imaginary of what it means to be 'in' Europe, 'in' a European field of online education and 'on' EMMA, making it possible to be included and at the same time excluded through multiple boundary systems.

Beyond-interface practices: Competing, comparing, translating

Practices beyond the user interface that enact European topologies arise out of relations between the European Commission, the EMMA team, and other (non-European) platforms. Specifically, based on the European Commission's ambition to compete with American and Asian MOOC platforms (European Commission, 2013), the EMMA team was urged to compare its performances against these platforms. This comparison was operationalized through an appeal to 'standard' performance indicators – enrolment numbers, video length, and visual appearance. These comparisons and 'standards' led, rather paradoxically, the EMMA team to emulate those platforms that they were complete with rather than performing a 'distinctive' European platform (see also Hartong, 2018). Given these contradictory logics, the EMMA team constantly negotiated between values of European (open) education that they wanted to adhere to, especially publicness and diversity, and the tendencies toward commodification and privatization apparent on North-American MOOC platforms (Van Dijck & Poell, 2015). For example, they had to balance their use of the English language with investments in translations, and had to decide between different business models. By mingling comparison, competition, and negotiation, their

practices generated a conflated Europe that merges and balances the of non-European platforms with a typical European space (Figure 12).

Next to relations between the EMMA team and the European Commission, the translation system assembled relations among 'providers' and partners which, in turn, generated other European imaginaries. This translation system, including AI, relied on human editing to 'feed' the software and, where possible to detect possible errors. For these reasons, the translations kept to languages that the providers were proficient in, while English served as a 'standard' language to enable those translations by others. This meant that English did not only constitute a connection 'between' local providers but also performed a boundary through which they mediate their content (cf., Prince, 2015; Star, 2010). In other words, to enact the European imaginary of linguistic multiplicity, their relations were continuously mediated through the boundary of the English language (Figure 13).



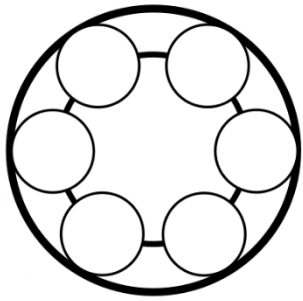


Figure 12 (left). The porous circle presents EMMA, the grey circle stands in for platforms it is compared against, and the lines indicate the area of convergence. **Figure 13 (right).** The small circles indicate the language of the providers, the line that connects them stands in for English as the mediating boundary with English as 'space in between'.

Data topologies

A final conceptualization that the EMMA initiators relate to 'openness' is experimentation and research through the use of data (Kerr & Eradze, 2016). What appeared is that the enactment of data is entangled with the network, access, and European topologies and, in this sense, that it binds together the various practices that make EMMA 'open'.

On-interface practices: You can see it because you are in it

When accessing EMMA on the user interface, specifically through the registration procedure, it becomes apparent how data are connected to personal accounts with records of learners' clicks and related visualizations. Specifically, the 'personal learning environment' (PLE) presents a vertical timeline with the latest activities, ring charts with the proportion of (un)opened learning materials and (in)correct quiz answers, and text bars with the number of comments and replies. These visualizations thus present what the learner has done *individually,* and what is still to be done in the same individual fashion. It thereby establishes the imaginary of *self-tracing learners* who draw on their past to plan 'future steps' (Thompson & Cook, 2017). This shows how data topologies intersect with access topologies, which perform the conditions of 'where' and 'when' learners (should) move through the platform. However, rather than building a common path, these data topologies transform access through EMMA into an individually adjusted path.

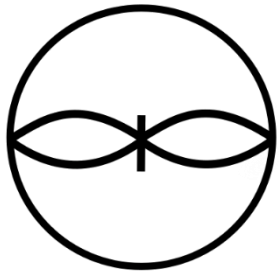
These visualizations on user interfaces do not only present learners in isolation but also relate learners to each other in two specific ways. First, the PLE presents aggregate statistics underneath the individual statistics, specifically on the same indicators. Even without an additional text, this establishes an imaginary of the outcomes that learners compete on, and hence, that are valued (Decuypere, 2016b). That is, in this case, it establishes an imagination of learners who aim to complete more lessons, get higher quiz grades, and post more comments and replies. Second, the PLE shows a network in which the individual learner is a 'node' connected to other learners

through a line – connections that are based on their comments and replies to each other. This network installs an imaginary of what it means to be connected, especially by illuminating *that* they are connected and to how many other learners, while leaving out other complex details of their learning experience (see also Marres, 2012). In this sense, these relations 'count' learners as individuals, rather than the collective ecology (Thompson & Cook 2015; 2017; Williamson 2017). At the same time, these visualizations 'fold' learners onto each other as their comparisons (Deleuze 1988; Figure 14). This topology does not just operate on the user interface but is intricately interwoven with practices beyond the interface.

Beyond-interface practices: The mold around the fold

Beyond the user interface, the EMMA team relates to data as visible indicators of learners and their behaviors. For example, dashboards on the backend show how many (times) learners visit particular MOOCs, over what period of time, and how long they watch a video or read a text before quitting it. The selection of indicators on which data is collected is mainly geared toward measuring the growth of MOOCs, and explaining how such growth can be achieved – which reflects the European ambition regarding OE (European Commission, 2013). In this regard, the EMMA team is urged to design MOOCs to 'attract' learners and to make instructional designs that 'fit' their learning behaviors. This, however, has particular implications for the workings of openness and boundaries in EMMA. First, the configuration of EMMA focuses on retaining existing learners rather than inviting new learners, which means that the boundaries around EMMA do not prioritize 'opening up' to learners who are not on the platform yet. Second, learners are reinforced in their behavior rather than invited to change. For example, they are not impelled to prolong their attention span when watching lectures or reflecting on the content of their interactions with peers. It implies that data establish a platform that operates as a *mold* around learners and their behavior (Figure 15). Because this shows how networks (i.a., relations among the European Commission, EMMA, and learners), access (i.a., who passes through the platform and how), and Europeanness (i.a., the ambition of the EC) are established

through data, it shows the centrality of data topologies for binding together the figure of EMMA as complexes of spaces-times.



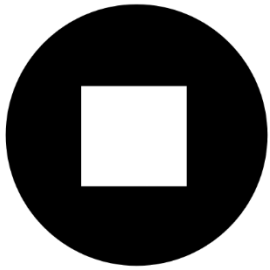


Figure 14 (left). The vertical line in the middle stands in for the dashboard that connects the learner and its 'fold', i.e., its presentation through numbers, which are the two oval (recursive) lines. **Figure 15 (right).** The square in the middle presents the (data of) learners that, like a figure-ground, are molded through the figure of EMMA (i.e., the circle).

Conclusion

The aim of this chapter has been to examine how an alternative view on openness could provide relevant starting points to understand and describe the enactment of openness in MOOCs. Based on the premises of social topology, the MOOC platform has been established as a figure composed of different relations that, as topologies, produce multiple overlapping spaces and times. These topologies are understood as imaginaries, i.e., materializations of collective norms about 'desired' futures that are made by making particular things (in)visible. Boundaries are considered to play an important role as they mediate different (in)visible settings and thereby, do not isolate spaces-times, but generate them through connections. Taking together these premises means that this view enables an understanding of openness produced through boundaries that generate particular imaginaries, rather than through the absence of boundaries.

This view guided an analysis of openness by showing how imaginaries, as forms of spaces-times that imply particular norms, are enacted through the EMMA platform. In particular, the EMMA platform constitutes network- access- European and data topologies that build on each other and are bound together and that, together,

generate 'openness' *through* particular boundaries. This generates a nuanced view of openness that goes beyond the ideal of 'complete' inclusion, for once and for all, but shows how openness comes forward through the multiplicity of various topologies. For example, network and access topologies in EMMA are produced through boundaries that 'open up' multiple ways of moving, while they continue as well as change 'typical' school constellations (e.g., Hassan, 2017). Moreover, European topologies enacted through the EMMA platform perform boundaries around and between European countries through the selective use of language and symbols but they also create shared spaces that are open to different European regions and bring them closer together (see also Opitz & Tellmann, 2015). Finally, data topologies produce practices that fold learners together, and that act as a mold around them, thereby making the platform 'open' to a particular kind of learner.

The findings of this study are not intended as a 'once and for all' definition of openness. By focusing on one platform, and applying a particular view, the definition mainly serves to spark the imagination regarding how openness can be conceptualized beyond the closed-open binary. In this sense, openness as a multiplex of various forms, each with its own 'openings' and 'closures' could constitute a relevant starting point for HE practitioners and researchers to speak about openness. First, it serves as a move away from the idea of openness as about boundlessness. It shows how HE is not 'opened up' just by introducing new actors and new connections (Ioannou, 2018), yet also foregoes a conclusion that openness is about a disruption of the higher education sector (Knox, 2016a). Instead, it describes how boundaries actually can serve specific interconnections that produce various forms of openness. Second, and related, rather than fixing a definition or a guideline to improve practice, it inspires discussions about what forms of practice, i.e., what imaginaries, are desired for the use of MOOCs in HE. The topologies described in this study therefore merely serve as conceptual tools and give researchers and practitioners new reference points for how openness can be conceptualized, operationalized, and enacted (Martin & Secor, 2014). This means that the findings of this study can be taken up by HE practitioners to think about how they 'design for openness', taking into consideration the multiple sorts of openings that can

be enacted and how they interact with each other. What the study thereby mainly stresses is the importance of engaging with what is made visible *on* and *beyond* user interfaces, and thus, what is included and mediated in the constructed imaginaries of openness in MOOCs.

What does this chapter say about European Open Education?

The focus of this chapter has been on the question of 'openness', and what can be learned from how it is enacted on this particular platform. The findings substantiate one of the main arguments of this dissertation, that is, that openness is enacted through *specific* orchestrations of boundaries rather than the absence thereof. While this argument is shaped by the initial idea of the user interface *as* a boundary, the chapter provides various exemplifications of how this idea allows a reconsideration of the 'Open' in online education. For instance, openness can manifest through 'deadlines' that – while limiting the 'flexibility' of a course – invigorate moments of coming together at specific web pages. It can also be about 'opening up' to specific audiences while 'other' students might less easily find their way. In this sense, rather than 'fixing' the issue of openness, this argument informs (this) research to further query how specific arrangements of boundaries emerge on (other) platforms. The assumption is that larger varieties of forms of openness expand possibilities to 'open up' to *different* practices and audiences – an ambition that is central to the Open Education movement (Baker, 2017; Rambe & Moeti, 2017). This shows the entanglement with the educational implications of 'openness', which surfaced in this chapter through 'typical' educational movements (e.g., gatherings, and traveling through a school building) intertwined with 'digital' movements (e.g., diverging hyperlinks, algorithmic personalization). The involvement of European policies materialized through the interference of the EC in the use of data, specifically focused on students' retention rather than on welcoming 'new' learners. This insight calls for continued attention to the values that these initiatives deploy, and whether the focus on individual performance is balanced against the value of collaborating through these platforms (see also Bayne et al., 2015).

What does this chapter say about the (developed) methods?

This case study tested out new methods for empirically engaging with platforms, and particularly rolled out the method of 'active navigation' in tandem with interviews with developers of a MOOC platform. Moreover, it introduced the conceptualization of these methods as an engagement with practices 'on' and 'beyond' user interfaces. The analytic techniques relied on social topological premises and combined this with the notion of the 'boundary object' (Star, 2010), navigations (November et al., 2010), sociotechnical imaginaries (Jasanoff, 2015), and 'the Open as the Visible' (Deleuze, 1988). This theoretical-conceptual repertoire generated a focused yet abundant set of findings, which showed its usefulness for an initial exploration of a field that, at that point, was relatively new to the research team. The visualizations have been resourceful tools herein, as they allowed scrutinizing complex relations *as* forms. More specifically, the use of (multiple) circles in combination with lines sparked the imagination about how these practices manifest as *multiplexes* of boundaries. In this regard, the circle has shown to expand the existing repertoire of visualizations that, generally, build on the tropes of regions, networks, and fluids (Decuypere & Simons, 2016; cf. Mol & Law, 1994). In this sense, the visualizations epitomize the idea that '*the Visible or the Open does not give us something to see without also providing something to speak*' (Deleuze, 1988, supra). Put differently, the visualizations manifest the capacity of social topology to introduce new imaginaries – simply by drawing new figures about existing practices. Based on this idea, the following empirical case studies explore the relevance of these circular visualizations for tapping into other questions in this dissertation – focused on the educational implications and the involvement of European policies in Open Education initiatives.

Chapter 4: Erasmus+ Virtual Exchange (SPF): Forms and Formations[2]

Captured under the umbrella term Open Education (OE), a wide range of new educational initiatives has been popping up in the educational landscape. These initiatives, including organizations (e.g., P2P University), learning theories (e.g., connectivism), and course structures (e.g., Massive Open Online Courses (MOOCs), Open CourseWare) have established themselves through various different practices (Neary & Winn, 2012). What remains common among these practices is their reliance on Internet technologies, their pursuit of innovative educational formats, and their goal of reaching people beyond the spatiotemporal and administrative barriers of institutions. Following these rationales, protagonists have argued that OE will 'disrupt' or 'fix' higher education practices (cf., Cormier & Siemens, 2010; Dumitrica, 2017). Considering that OE stands in a long history of efforts aiming to 'open up' education, such as the Open University or the mushrooming ideas of 'open classrooms' in the 1960s (see Barth, 1977), the revolutionary status of OE has been contested. Scholars particularly pointed at the various, unanticipated, and often contradictory ways in which educational openness is established and, consequently, called for more critical studies on OE (e.g., Bayne et al., 2015).

Parallel to this discussion on openness, debates on the educational character of OE initiatives have emerged. On one side of this debate are again protagonists, who promote OE as solutions to inefficiencies and inequalities in higher education because of their capacity to democratize 'best' practices (see Dumitrica, 2017). On the other side of the debate are (academic) critics, who have pointed at possible harmful implications of OE for the educational field. Their arguments are often developed

[2] This chapter is an adapted version of the publication:
van de Oudeweetering, K., & Decuypere, M. (2021). In between hyperboles: forms and formations in Open Education. *Learning, Media and Technology, 46*(1), 60-77. https://doi.org/10.1080/17439884.2020.1809451

through analyses of general OE trends and stress, among other things, how many initiatives are designed to serve 'self-regulated learners' rather than to bring students together and how their rationales are mainly political or economic at the cost of thoughtful pedagogies (Farrow, 2017; Knox, 2013a; Storme et al., 2016; Terras & Ramsay, 2015). Differently, some arguments are developed through empirical (case) studies that address how specific OE initiatives draw learning theories, like constructivism or connectivism –a theory that applies to specific forms of OE (Knox, 2014; Neary & Winn, 2012). In this sense, academic studies have generally assessed and criticized OE against the abovementioned ideas on what education should be, creating a critical hyperbole that overlooks how Open Education practices actually *do* constitute new forms of education (see also Gourlay, 2015). To interfere in this tendency to counter overly optimistic views with merely critical notions, there is a need for studies positioned in between positive and negative hyperboles on OE and that are sensitive to the multiple ways OE is understood and practiced. This means that it becomes necessary to develop empirical-analytical accounts of OE initiatives that allow seeing, understanding, and tapping into the evolvement of these educational practices (Decuypere, 2018b).

Following this line of thinking, this study aims to offer empirical ground for understanding how OE introduces new forms of education. It does so by focusing on one OE initiative, namely the Virtual Exchange format by the Sharing Perspectives Foundation (see Sharing Perspectives Foundation, 2020). The case is considered specific in the way it integrates various digital technologies, that is, how it combines a MOOC design with weekly, synchronous, small-scale, guided dialogue sessions. We start from this specificity to consider how practices in this initiative establish (new) educational typicalities. Social topology is thereby taken up as a theoretical vantage point, with a dedicated focus on infrastructures and infrastructuring practices. The question that guides this study, then, is how practices in this OE initiative are formed, what is specific about them, and how they can be typified. This chapter reports on the study, first of all, by providing a guide through the theoretical–conceptual framework. It starts by introducing social topology as a theoretical lens, explains how this lens

considers forms and formations of practice, and how it considers how infrastructures and infrastructuring practices perform these form(ation)s. In the following section, the case under study is described in more detail. Then, the methodology and process of data collection and analysis are discussed, with specific attention to three modes of analysis (textual descriptions, visualizations, and legends) that substantiated the social topological approach. Findings are respectively formulated in three accounts that address forms as well as formations in the OE initiative, building on the three modes of analysis to structure their presentation. The chapter will conclude by relating these findings to (theoretical) literature, and by consequently opening up a discussion on the relevance of social topology for tapping into educational typicalities of OE.

Theoretical-conceptual framework

Social topology, specificities, and typicalities

The study is theoretically positioned amongst various relational approaches that share a critique on dualisms between subject-object, agency-structure, and human-material, and that consider education as a set of practices contingently performed through relations between people and matter (e.g., Gorur et al., 2019). The study specifically takes up social topology, a theoretical lens dedicated to analyzing practices and how they generate spaces and times through forms and formations. Notably, social topology is a relational approach developed by scholars in the field of Science and Technology Studies (STS) with an interest in the local situatedness of scientific practices. STS stress, for instance, how scientific practices extend beyond their performance in laboratories, through papers, or through graphs, and stage how these practices generate multiple and constantly changing spaces-times too (e.g., Law, 1999; Law & Mol, 2001). For instance, they present how the communication of scientific findings installs network-formed spaces, while they are also de- and re-composed into fluid-formed practices (ibid). In this vein, social topology evolved as an approach to scrutinize how practices concretize in specific forms while adopting a wide array of (spatiotemporal) conceptual resources to comprehend them. By formulating concepts to characterize these complex scientific-social practices, social topology has provided tools for social scientists to open

up new discussions on, and thereby to interfere in, practices they are studying (Mezzadra & Neilson, 2012).

Besides being adopted in the transdisciplinary STS tradition, social topology has also guided studies in fields like political sciences, social geography, and cultural studies to scrutinize power structures, inclusion and exclusion or new modes of interaction (e.g., Allen, 2009; Ootes et al., 2013). Social topology has equally slowly made an entrance into educational research, with studies pointing at multiple spatialities produced through classroom practices (e.g., de Freitas, 2012; McGregor, 2003) and evolving from education policies (e.g., Landri, 2015). In a similar manner, social topology has been adopted to understand how online learning establishes new relations between students, institutions, and other (human-material) actors and how this, in turn, generates new spaces-times (e.g., Bayne et al., 2014). Moreover, these social topological studies yielded new typifications of (online) education practices, especially by drawing on spatiotemporal concepts from the transdisciplinary field of STS, like presences, distances, and mobilities (ibid). These typifications are generally developed to address what relations hold together as well as how they are arranged, that is, to characterize their specific forms (Decuypere & Simons, 2016). While spatiotemporal concepts have been very fruitful in formulating initial social topological typifications of educational practices, there is still much to gain in expanding the repertoire of educationally attuned concepts (Decuypere, 2018b). That is, it is only in the field of educational research itself that social topology can be deployed to develop typifications that can characterize practices as forms of education.

Stabilizing forms and changing formations

Since social topology addresses how practices produce spaces entangled with *times* (cf. supra), it considers forms and formations distinctly from each other. Forms, on the one hand, are understood as stabilized arrangements of practices, established through external indicators like codes, labels, or classifications. Formations, on the other hand, are practices that continuously change in form without breaking (cf. Lash, 2012; Thompson & Cook, 2015). A printed textbook can be considered an example of a

form, as it is a fixed arrangement made up of external references (including vocabularies, alphabets, and so on). However, when adding notes or involving multiple readers, books expand beyond their fixed print and become stretching formations of practices. This can be illustrated through different concepts and visualizations. For instance, textbooks are *enfolding* new ideas through attaching annotations, are *twistfolding* when read in a non-linear order, or are *doubling or folding onward* when recited in different ways (see for illustration Figure 16).

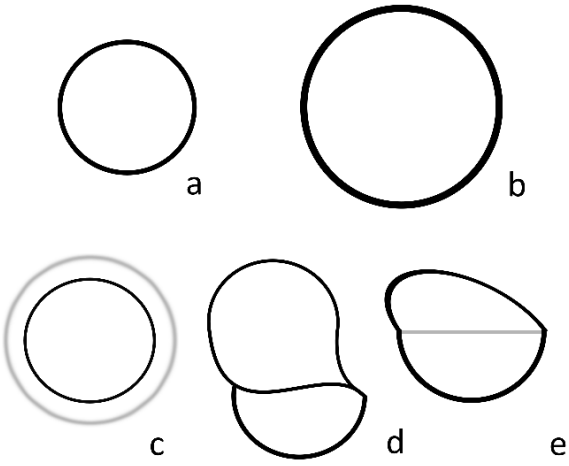


Figure 16. a-b indicates continuous stretching, a-c illustrates enfolding, a-d illustrates twist-folding, a-e illustrates folding as doubling.

Screens and digital devices, in this vein, are quintessential examples of formations, as they install 'a space in which object-images are animated or brought to life in continuous movement' (Lash, 2012, p. 10). Especially the interactive features of digital devices set up new sorts of spaces-times, i.e., new realities that are constantly changing with the individuals and objects it connects with (Iliadis, 2013). The digitalization of (open) education thereby introduces more continuously changing arrangements of practices, i.e., formations, that cannot be captured through external indicators like 'inside', 'outside', 'above' or 'beneath', which necessarily actualize stable forms (Ash,

2015; Lury et al., 2012; Thompson & Cook, 2015). Formations are, in this regard, aptly presented through spatiotemporal concepts and visualizations that support close scrutiny of arrangements while surpassing fixed terms (see for example Figure 16). More specifically, these concepts and visual presentations allow engaging in questions about how OE is (re-)arranging educational practices through digital technologies, whether and how they are continuously changing or introducing (new) fixities, and whether and how these arrangements can be typified as educational forms and formations.

Social topologies of infrastructuring practices

Adopting social topology to scrutinize forms and formations of practices in OE has further directed the study to consider *infrastructures* and *infrastructuring practices*. Being enacted online, OE is set up through technological, financial, and regulatory infrastructures that connect learning materials, teachers, and students in new practice arrangements (Knox, 2013b; Oliver, 2015). Infrastructures are, in this regard, stable constructions of standardized measures such as codes, data, and other classifications that order relations in unity and coherence (cf., Star, 1999). Infrastructures thus generate stabilized *forms* of practice. However, infrastructures are also constantly maintained and adjusted, which implies that 'to infrastructure' is an ongoing practice in itself (Star & Bowker, 1991). Infrastructuring thereby points to continuous change, including constant local interactions with infrastructures, maintenance work, and subtle adjustments that reshape the infrastructure as a whole. In online learning environments, for example, infrastructuring practices involve interactions between different local working- or study places, and that *fold* practices 'here' (e.g., office) and 'there' (e.g., online) (Dahlberg & Bagga-Gupta, 2017; Landri, 2013). In this way, infrastructuring practices set up *formations,* especially local back-and-forth movements that allow actors to be connected in constantly morphing, extending, and multiplying forms while maintaining their inherent relations (Easterling, 2014; Gulson & Sellar, 2018).

The case

Following these premises, this study focuses on an OE initiative included in the recently launched Erasmus+ Virtual Exchange (E+VE), a pilot project inquired by the European Commission (EC). The explicit goal of E+VE is to scale up the Erasmus+ programme, which is the main programme focused on mobility in European (higher) education. In this case, E+VE adopts virtual exchanges (i.e., activities that exist before and beyond European policies) to enable interaction between young people (18–30 years old) from European and Southern Mediterranean countries (as explained in European Commission, 2017a). The rationale of virtual exchanges is to establish various forms of online, small-scale dialogues that continue over several weeks and that address regional, cultural, and personal differences between participants (O'Dowd, 2018). These dialogues are always guided by facilitators who are, in the case of E+VE, trained volunteers (ibid.). Several types of virtual exchange activities are part of E+VE, but this study specifically focuses on the 'Interactive Open Online Courses' (abbreviated in this chapter to IOOCs). The Sharing Perspectives Foundation (SPF) is the organization within the E+VE consortium that is mainly responsible for developing and continuing these IOOCs. On their website, SPF describes the IOOCs as MOOCs complemented by virtual exchange (Sharing Perspectives Foundation, 2020). In practice, this means that there is a specified curriculum with related materials, including a course outline, video lectures, and assignments, that can be retrieved on the SPF website. This curriculum is linked to weekly dialogue sessions within subgroups of 8–15 participants on a platform named 'the exchange portal', which is developed by another organization in the consortium, Soliya. Participants can register, free of cost, if their age and residence or nationality correspond to that of the 'target audience' as defined by the EC (cf. supra; European Commission, 2017a).

Methodology

The methodology of this study integrates the theoretical–conceptual framework to attend to these IOOCs in a specific way. First of all, to focus on infrastructuring, the process of data collection was inspired by the premises of the 'ethnography of

infrastructure' (see Star, 1999). Practically, this meant that different sites and participants were involved in this study, as they rendered insight into various local infrastructuring practices in the IOOCs. The first site was a central office of SPF, where one of two locally working staff members was interviewed for 2.5 hours and notes on the location were made. A second site was established over teleconference: most staff members were working remotely across different countries and, in this way, interviews with them could be conducted. A total of 5 staff members were interviewed in this fashion, with interview lengths ranging between 40 minutes and two hours. The interview questions were specifically focused on local practices, making the research mobile despite a disembodied presence (cf., Landri, 2013). Next to the interviews, a third site for data collection was the online environment of one IOOC. The first author was present for the five weeks it lasted, followed all video lectures, prepared reflective assignments for this IOOC, and participated in the five weekly dialogue sessions for part of this IOOC. During the dialogue sessions, the researcher made short jottings on technological-formal arrangements (i.a. buttons, displays, sequences), and translated these into memos only after the dialogue sessions. Memos were also integrated into further interview questions to address whether and how formal features were arranged continuously and similarly throughout the different IOOCs within the E+VE program.

The theoretical premises of this study are also integrated into a relational approach toward ethics. This meant that the interests, needs, and concerns of researchers and participants are considered in dialogue, and throughout the whole research process (Ravitch & Mittenfelner Carl, 2015). Accordingly, each moment and place of data collection was consulted with the SPF team. For the interviews, wishes, and rights with respect to staff members' contributions were discussed and specified in a consent form. We specifically asked what were their wishes concerning the researchers' participation in the dialogue sessions, and thereupon agreed that the researcher introduced herself to other group members as a PhD student invested in a research project on online education and that she followed this IOOC out of her research interest. The decision to make notes only on formal arrangements in the IOOC (cf. supra) and not on the contributions of participants, made that the dialogue

sessions were kept confidential. In this sense, the position and presence of the researcher have been profound in reconstructing the IOOCs as the 'case' in this study (Piattoeva et al., 2019).

Finally, the conceptual–theoretical vantage point largely shaped the process of data analysis. That is, after interviews and observation notes were altogether translated into digital texts, they were analyzed holistically. The first round of analysis served to highlight data fragments that indicated infrastructures and infrastructural practices. Again, principles of the 'ethnography of infrastructure' formulated by Star (1999) were adopted as sensitizing concepts. This meant that practices were recognized and highlighted as infrastructuring practices when they were (1) embedded into wider connective practices (2) transparent in use (3) broad in reach and scope (4) part of 'membership' or community work, (5) were linked to 'conventions', (6) included standards as connective joints (7) were built on installed base and (8) became visible upon breakdown (ibid.). The use of these concepts for analysis is that they *"are not intended as ends in themselves, but as means of analytical entrée and provisional theorizing"* (Clarke & Star 2008, p. 118). After that, the second round of analysis consisted of 'connecting strategies', including writing analytic memos, which served to connect and re-organize data fragments in new arrangements (cf. Ravitch & Mittenfelner Carl, 2015). These arrangements were iteratively formulated and constantly compared with interview data and participation notes to remain faithful to the way practices emerged throughout data collection. This resulted in three accounts of practices that, based on interviews with staff members, pertained to all IOOCs running within the E+VE program (cf. supra). Throughout the development of these accounts, social topology informed three further modes of analysis. The first mode consists of textual descriptions that address in detail 'what' and 'who' is connected through infrastructures and infrastructural practices, as well as what these practices look like. These descriptions thereby attune to the specificity of practices whilst suspending initial evaluations or typifications (cf., Ceulemans et al., 2014). The second mode entails visualizations that complement textual descriptions and that help to show how practices, as described through text, are arranged in specific relational distributions

(Decuypere & Simons, 2016). In other words, visualizations are useful tools to grasp forms and formations, as they give substance to intrinsic relations making them up while bypassing extrinsic textual indicators such as 'above' or 'below' (cf. supra). Concretely, the visualizations in this study were purposefully developed alongside the textual descriptions and served as 'trials', i.e., formative assessments of how social topological arrangements can be seen well (see Latour, 2005). Tilted circles and lines served as starting points for the visualizations. Especially because of their bounded character, circles allowed distinguishing discrete actors (e.g., students, technologies). Moreover, their unique constant radius distracts least from questions about distance and therefore aids a study of social topological relations (see also van de Oudeweetering & Decuypere, 2019). While necessarily 'freezing' movements in the visualizations, the tilts allow presenting overlaps between circles (i.e., actors) and lines show connections within and between them. In this way, this kind of analysis deals with movements while equally taking account of moments in which practices are stabilized (Gulson et al., 2017). The visualizations then interact with a third mode of analysis, legends, that address the way the researchers were involved in analyzing, interpreting, and making the visualizations (Latour, 1986). In other words, the legends operate as analytic aids to 'read' the visualizations, and how they connect to the described practices. These legends are, in this chapter, materialized as captions and more elaborate analytic discussions that show what is specific and typical in the described and visualized arrangements. Thereby, the research acknowledges and underlines how it does not aim to represent reality, yet it co-constitutes realities along with practices observed (cf., Mezzadra & Neilson, 2012).

Findings

The findings comprise three accounts that do not (exhaustively) represent the practices in the IOOCs of the Sharing Perspectives Foundation, but that serve to reconstruct prominent infrastructures and infrastructuring practices. Each account starts with textual descriptions, focused on a specific arrangement of practices in the IOOCs, which are supported by interview fragments and screenshots. These textual

descriptions are rendered into visualizations which are presented alongside the texts. Furthermore, legends are depicted through captions that serve to analytically read (the relations between) the descriptions and visualizations and through textual elaborations that follow the descriptions in service of typifying the forms and formations.

Groups

Participation in the IOOCs was initially set up through a registration process on dedicated pages in the exchange portal. The first page of the registration presents two 'checkboxes' to confirm consent with the privacy statement and check the age requirements. The following page explains a profile is made that to allow safe online interaction with peers on the exchange portal. A username, email address, and password are solicited and, on the same page, another set of data is prompted, i.a. name(s), gender, nationality, native language, birth date, and local time zone. Furthermore, the page presents a set of timeslots with checkboxes, with a caption that emphasizes that registrants should commit their availability for all weeks of the online dialogue sessions. Registered participants receive, after a set deadline, an email with an individual student number, a group number, and the timeslot for the weekly dialogue sessions. From this moment on, the menu bar in the exchange portal shows a (group-numbered) 'stream' for the course (i.e., a channel with posts) and 'meeting room' (i.e., the interactive page where the dialogue takes place). These streams and pages are then only accessible to those participants assigned to the same group number in the course. What is not visible to participants is how these groups are made based on their availability and their profile, as one of the staff members commented:

'[..] we try to get a proportionate amount of those registrants that are from EU countries and [..] that are in Southern Mediterranean countries [..]. But then [..] we try to have a smattering of countries within, so that not all of the students from Southern Mediterranean are from Algeria and all of those from EU from France.'

This shows how groups are arranged through categories, i.e., standardized indicators that make the personal characteristics of participants comparable across different

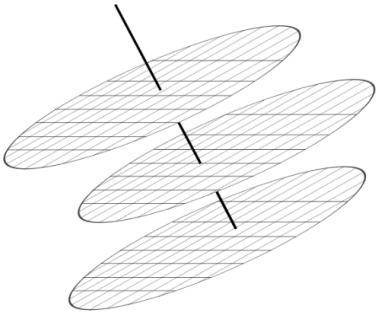
locations within infrastructures (cf., Star, 1999). In other words, infrastructures draw on categories as external measures to construct stable forms for profiles and that, by these means, make participants assessable in terms of differences and similarities. What is specific in the IOOCs is that formed profiles are, consequently, connected through other fixed indicators, including shared group numbers, streams, channels, and timeslots. In this way, infrastructures make groups through profiles *as* forms and *in* forms (see Figure 17). This specific constellation of infrastructures enables 'safe online interactions' (cf. supra), as well as a stable place and time to come together without irregular 'drop-ins' and regular 'drop-outs' (cf., Cormier & Siemens, 2010). Through this stable, closed, grouped space and time construction, infrastructures arrange practices in the IOOCs along the principle of commonality in a school form, while simultaneously constructing an 'envelope' that transfers this form into an online setting (Dussel, 2014; but also see Ash, 2015). After registration, however, different arrangements of groups are constructed. As one staff member noted:

'we don't want to make students within their group a representative of their nationality, or cultural group, so we want them to do research within their own society, nationality, and to be able to present the results without having to identify with it'.

'Doing research' was mainly organized through assignments, which encouraged participants to conduct video-recorded or transcribed interviews with family members, friends, or other people in their local environments. After that, these interviews were shared and discussed in the dialogue sessions and, in turn, the participants were asked to talk about the results of those dialogues with their interviewees. Other activities in the dialogue sessions that addressed participants' localities were 'icebreakers'. At the start of each dialogue, participants were, for instance, asked to give a lively example of a local linguistic expression, to discuss a recent political event, or to elaborate on their daily work-, study-, and leisure settings. Similar to the research assignments, these icebreakers give a stage to differences within and between regions, genders, age groups, or other characteristics through which

participants are previously categorized, while equally showing the similarities across these categorizations.

Especially since these assignments and activities are consistently integrated into dialogue sessions where participants are asked to 'sit with their differences', as one of the staff members explained, they materialize infrastructuring practices – practices that relate people and 'things' (here, categories) but that are continuously changing. More specifically, these infrastructuring practices enact continuous formations that overlap, interfere with, and complicate the stable forms organized around categories (cf. supra). These formations operate as hinges that allow differences and similarities to fold onto each other (i.e., overlapping) as well as to unfold (i.e., emergent appearance) (see Figure 18). These interchanges can be typified as 'bouncing' movements, i.e., constant interactions between the 'local' and the 'shared' that make infrastructuring responsive to, and generative of, differences (Easterling, 2014).



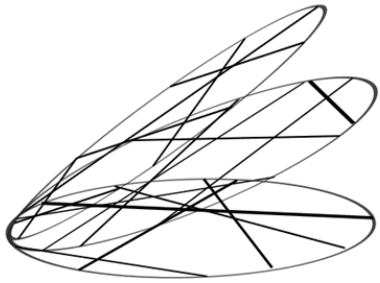


Figure 17 (left). Visualization of the 'forms' of groups. The circles indicate the profiles of participants, and the lines within the circles indicate categories that make them comparable. The line running through the circles indicates how streams, channels, and timeslots link participants through differences in their categories, while equally stabilizing a dedicated moment-place for a meeting. **Figure 18 (right).** Visualization of the 'formations; of groups. The circles are participants, and the mixed-up lines in the circles present how the categories of the participants are stirred up. The circles, i.e., the participants, are now connected to a 'joint' or 'hinge' which presents how shared activities and assignments create a new sort of moving connection. This joint allows a folding (i.e., overlapping) as well as unfolding (i.e., emerging appearance) of local differences.

Meeting rooms

Meetings rooms, the interactive pages where weekly dialogue sessions take place (cf. supra) further arrange participation in the IOOCs, as they set up relations between participants and technologies in a specific way. First of all, meeting rooms include video technologies that display participants and facilitators through recordings of their webcams, all assembled in a circle. Second, they integrate audio technologies, operationalized through a button in the center of the circle. This button is initially a 'talk button' which makes participants audible when they click on it, and then transforms into a 'release' button. Other participants see a blue frame around the display of the audible participant, as well as a 'raise a hand' button that, when being clicked, will allow them to 'get the mic' when the audible participant has pressed release. Their upcoming turn is then visualized by a yellow dot in the upper left corner of their display. Textual technologies are materialized through a shared chatbox in the center of the circle and is used by participants and facilitators to give short commentaries or summaries of what is said throughout the dialogue. There is also a private chat function, allowing messages to one dedicated person in the meeting room without anyone else seeing it. Staff members noted how this constellation is purposefully constructed, for example:

' … I think the way the platform is designed is very much related to the philosophy of listening, related to trying to create equality between participants'.

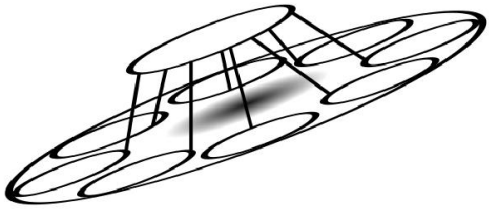
This statement shows how technologies in meeting rooms operate in an infrastructure that is designed according to particular values (in this case, equality, cf. Star, 1999). These infrastructures especially establish practices in a form that relies on fixed indicators like buttons, signs, and fixed layouts (see Figure 19). At the same time, they flow over into new vocabularies (e.g., 'get the mic', 'raise a hand'), new habits, and, hence, new realities for people interacting with them, while the buttons, signs, and layout are becoming themselves part of a 'taken-for-granted' background (cf. Illiadis, 2013; Bowker & Star, 1991). What typifies this form of practice is that people are

gathered around a common object of study in an equal position while mediated through technology. In this sense, practices are arranged in a typical form of a classroom, showing how such a form can be reconstructed through digital means (cf. Masschelein & Simons, 2013). However, meeting rooms do not always operate according to this constellation. Internet connections got (temporarily) interrupted, the microphone stopped working, or other technical issues frequently suspend dialogues. When this happened, participants' displays disappeared from the assembled circle. Members of the 'tech team' would contact them through another teleconference tool or email to support them in repairing their technologies. When participants were able to return to the meeting room, their display appeared again on the left upper side of the circle. This meant that, while the position of participants in the assembled circle was reshuffled throughout the process of these technical issues, the circled shape remained intact. This exemplifies how these seemingly disruptive incidents did not break connections between participants. Even more so, these arrangements turn technologies themselves into a topic of dialogue, as a staff member noted:

'[..] unfortunately, this happens in places that have lower bandwidth you know, […] sometimes that is really apparent in ways that we really have to, yeah, we ask the facilitators to make those things explicit and maybe even use it as a point of conversation of why certain people aren't able to join on time, or why participants from Gaza will sometimes have a power cut in the middle'.

This shows how meeting rooms are equally constantly maintained and adjusted in order to allow their functioning to be continued, and thus, how infrastructuring practices make up meeting rooms (cf., Bowker & Star, 1991). Moreover, the way these infrastructuring practices keep participants connected despite constantly moving 'inside' and 'outside' the meeting rooms, illustrates how these practices constitute continuous formations (see Figure 20). Specific to the case of these IOOCs is that these formations materialize and make visible local differences between participants (Dahlberg & Bagga-Gupta, 2017; cf., Star, 1999). Moreover, these constant movements of and in the meeting rooms establish proximities and distances towards

the technologies, i.e., different positions that encourage critical scrutiny and discussion about how technologies operate and shape (educational) practices (cf. Dussel, 2014).



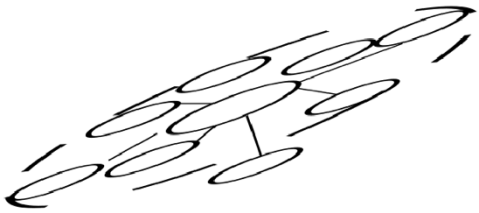


Figure 19 (left). Participants and facilitators are presented in small circles, assembled and enclosed in a larger circle which presents the meeting room composition. Technologies are positioned in the middle. The delineated, upper circle explicates the authority position. The shadowed circle illustrates how realities are installed through 'authoritative' technologies. The lines show how the technologies connect participants as well as keep them in a fixed constellation. **Figure 20 (right).** Participants are presented as small circles, with dotted lines showing how their connections are temporarily suspended through technologies. The meeting room is presented as a larger circle, equally with gaps that show the technological interruptions. The middle circle indicates how technologies moved from their authority- and reality-producing position, while remaining at the center to be scrutinized.

These formations thereby exemplify infrastructural 'bounces', ongoing back-and-forth movements that give rise to multiplicities and differences (Easterling, 2014). In this vein, this account shows how infrastructures of the meeting room make up a stable reality that fades into the 'background' while infrastructuring of the meeting room makes this constellation visible by giving a stage to change, and differences *in* change.

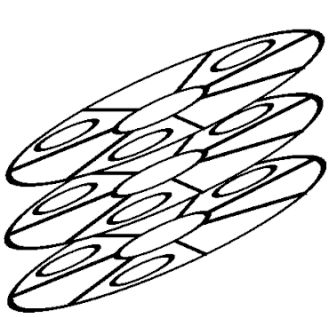
Emails

A third and final account of practices with the IOOCs focuses on the role of emails, which are manifested in different ways. First, there is the 'recap' email, written by facilitators and sent to participants of the dialogue group within a couple of hours after the weekly session. This email includes a summary of the dialogue session as well as an overview of assignments and materials covered in the following week. Second, there

is the 'weekly Monday mail' sent by SPF staff to all participants in the IOOC. This email outlines activities and (hyperlinks to) materials in that specific week, i.a. video lectures and assignments, and also (re-) articulate participants' individual student numbers, dialogue group numbers, and start- and end time of the session with reference to the time zone. Third, there is the 'weekly reminder', customized to be sent out on the day of the participants' dialogue session, which reiterates details of that session. This email equally includes a hyperlink to the platform and contact information for E+VE helpdesk(s). By consistently relying on standardized measures such as dates, time(zone)s, group- or student numbers, and hyperlinks to specify what, where, and when needs to be studied, emails appear as part of a constructed infrastructure. That is to say, they show how infrastructures integrate standards in order to establish mutual, common, and stabilized forms of practices (see Figure 21; see also Star, 1999). What is particular about these forms is that they establish rhythms, sequences, dedicated places, and references to study materials that make up the fabric for gatherings within this constellation. In this sense, these emails materialize the typical function of curricula to explicate a stable space- and time constellation (Nespor, 1994).

This constellation of emails does, however, not only establish stability. First, emails are constantly updated by staff members and personalized based on the profiles of participants. In this way, emails continuously respond to 'where' and 'when' participants are situated in the course, reiterating what is already done and what should be done in the upcoming weeks. Second, hyperlinks and contact information in the emails establish various 'interactive' pathways between participants, course materials, meeting rooms, and their e-mail inboxes, those of the staff, and of other participants. These interactive pathways are structurally embedded in the design and maintenance of the IOOCs, which shows how they operate as part of the infrastructuring practices. More specifically, these emails act on stabilized forms – the weekly sequences, the 'set' of materials – while they ingrate updates, personalizations, and variations that translate them into formations (see Figure 22). What is specific to these formations is that they establish continuous 'pulls' into the course environment, followed by a 'push forward'

into future steps in the course (Decuypere, 2018b; Oliver, 2015). In this sense, these emails can be considered to enact constant back-and-forth movements of infrastructures, i.e., bounces, that generate sustained and extended practices in multifarious ways (cf., Easterling, 2014). This means that, as forms, emails establish a curriculum composed of stable sequences of coming together. As formations, on the other hand, emails generate various movements while acting with and on a stabilized set of practices.



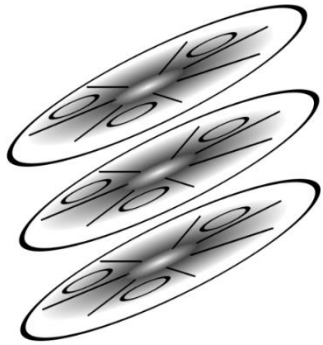


Figure 21 (left). The overlapping circles constitute the three emails, sent out to participants (presented as circles in the middle). Three small circles and lines within the circles materialize the fixed rhythm, sequence and content of the emails. Their overlapping and doubling arrangements of the circles shows how emails fix an arrangement (i.e. of curricular practices) across participants. **Figure 22 (right).** Again, the overlapping circles constitute the form of curricular practices, but the gradient and the interrupted lines within the circles indicates how emails (i.e., the smaller circles) move within this form.

Discussion

This study has sought to construct a middle ground between positive and negative hyperboles about OE and to consider how OE introduces new forms of educational practices by means of an empirical inquiry into one OE initiative. Social topology is thereby adopted as a theorizing lens to look at the specific infrastructures and infrastructuring practices of the initiative and to consequently invoke educational typicalities. The empirical accounts resulting from the analysis distinguished practices that involve groups, meeting rooms, and emails. The accounts, first of all, showed how infrastructures stabilize forms of practice, necessarily drawing on external and fixed

measures in order to bring different actors together into (more or less) stable constellations (Star, 1999). Practices in this specific initiative thereby form recurrent, closed, and sustained gatherings, around a shared object of study and a common curriculum. Following these specificities, these forms of practice are presented as typical school forms, classroom forms, and forms of curricula (cf. Dussel, 2014; Masschelein & Simons, 2013; Nespor, 1994). The accounts further showed how infrastructuring practices arrange formations, i.e., constantly changing practices. The formations in this specific initiative enact constant interactions between difference-similarity, inside-outside, offline-online, and pushing-pulling. These formations consistently came forward as typical bouncing movements, ongoing back-and-forth (ex)changes with/in infrastructures that generate multiplicities and continuities in practices (see Easterling, 2014). Because they are acting on and interacting with infrastructures, these bouncing movements do not only lead to continuous movements but necessarily rely on stable forms too (Gulson et al., 2017). These formations that generate the interplay between bouncing movements and stability are, in this study, typified as enfolding formations. This enfolding operates as an envelope that *'covers, protects and surrounds what it holds and helps ensure its contents arrive safely in another time and space'* (Ash, 2015, p. 81). In other words, enfolding formations change practices in the digital setting whilst holding continuity with typical stable school forms, classroom forms, and forms of curricula. These formations thereby exemplify how education is being enacted through continuously transmogrifying, overlapping arrangements of practices (see Thompson & Cook, 2015). This allows rebutting the positive and negative hyperboles that argue that OE either 'fixes' or 'radically disrupts' education. More specifically, the forms and formations performed through this study show how OE introduces changes while, at the same time, building on and continuing existing educational forms.

Because these findings are based on one specific case, however, they do not necessarily epitomize the broader field of OE. Nevertheless, they establish new starting points for analyzing and theorizing practices in other OE initiatives or even in digitally-mediated settings within 'closed' educational institutions. That is, they encourage

researchers to zero in on what digital technologies do to educational settings, whether these 'doings' imply continuities or change and, more so, what is being changed or held the same. The chapter shows its contribution to pursuing this kind of research by using and attuning conceptual devices, more specifically, bouncing as a movement of generating and illuminating *difference* and enfolding as a process of keeping relations between inside and outside technologies. It is exactly in this way that social topology has shown to support the theorization of OE while remaining in touch with the various as well as continuously evolving practices making them up, as such avoiding slipping into hyperbolic stances.

With its multifarious focus, the social topological approach in this study builds on and weaves together various existing approaches that have already provided a more nuanced outlook on OE. For example, with its focus on change and continuity, social topology is positioned alongside historical approaches rebutting the radical novelty of OE (Barth, 1977; but also see Bayne et al., 2015). Furthermore, by highlighting how relations are centralized or how new authorities emerge, social topology follows studies approaching OE from the perspective of critical theory (e.g., Farrow, 2017). Finally, as a relational approach, social topology builds on the premises of socio-material studies that stress how OE is made up of various, complex, and local human-material interactions (Gourlay, 2015; Oliver, 2015). Nevertheless, social topology is not just one among various approaches that recognize complexities in social practices and contributes to research on OE in a new, unique way. First of all, by acknowledging forms as well as formations, social topology addressed the complexity of infrastructures and showed how they instantiate steady systems while equally morphing with realities they encounter (Easterling, 2014; Gulson & Sellar, 2019). Social topology thereby showed itself as a relational approach that surpasses and taps into oppositions, including stability-change (cf. Gorur et al., 2019). Second, social topology established a bridge between theoretical analyses and 'on-the-ground practice'. It has done so by attending to specificities in educational practices in order to evoke typicalities, that is, to discuss how practices in this initiative can be characterized as bouncing and enfolding movements. Third, social topology offers

unique methodological starting points for scholars and practitioners in the field of educational technology to deal with critical developments in and beyond OE. By suspending taken-for-granted tropes, it urges the use of versatile analytic tools to show and tell how exactly these settings are configured, through what actors, and through what movements, changes, and operations (Ceulemans et al., 2014; Decuypere & Simons, 2016). This means that it is an approach that requires scholars to methodologically formulate reconfigurations, and in this way, to make research necessarily an involvement, interrogation, and interference in ongoing practices (Mezzadra & Neilson, 2012).

Overall, adopting the social topological approach to study the IOOCs in the Erasmus+ Virtual Exchange program granted insight into a very specific arrangement of practices in OE. Beyond yielding a theorization of these practices as forms and formations, it also sparked questions about how OE can introduce new educational values. That is, especially as practices in the IOOCs generated comparisons and differences, authorities and equalities, rhythms and sequences, they appear to enact typical ways of valuing (see Decuypere & Simons, 2016). As more social topological studies on various dissimilar educational constellations are developed, more of these ways of valuing can be scrutinized for how they are actually constructed. Social topological tools for description, visualization, and analysis thereby establish new possibilities for scholarship in OE and other digitalized education settings to open up discussions about the specific and typical construction of educational values. It offers ways for scholars to be positioned between positive and negative hyperboles and to start from observations of practices in the field of Open Education to theorize the connection between continuity and change, and what this brings into existence.

What does this chapter say about European Open Education?

This chapter accentuates the educational implications of an online European initiative, which is coupled with the ideal of openness because of its affiliation with a MOOC design. The chapter shows how this initiative realizes typical educational forms by continuing the 'traditional' repertoires of schools, classrooms, and curricula – forms that prioritize recurrently coming together – while leveraging possibilities of the Internet to make young people 'move' between their local setting and shared online dialogues – forming difference, similarity, and unfolding change. In this sense, what is specific to this initiative is that it is not just an 'automated' course put online: it involves the continuous and synchronous presence of people who are urged to listen ánd talk to each other, and who thereby simultaneously turn into students and teachers (Dussel, 2014). With respect to 'openness', the chapter repeats the observation that forms of openness are established through boundaries. In this case, openness is enacted through a prescripted registration procedure that enables diverse group formations, a 'closed' meeting room that maintains confidentiality, and a consistent set of reminders that urges sustained engagement. The involvement of European policies shows itself in the selective entry of participants from countries within, and immediately around, the borders of European territory (European Commission, 2015). These findings raise two *new* questions that are pursued in the following empirical case studies. First of all, it raises doubts about whether and how European online education initiatives affiliated with the denominator of 'openness' are selectively and strategically realizing borders, and thereby emulate trends in European migration policy (Pollozek & Passoth 2019; Plájás et al., 2019). Second, it sparks a curiosity regarding Open Education initiatives that rely more on automated functions than on synchronous human-to-human interactions, and how these may install *different* educational relations.

What does this chapter say about the (developed) methods?

The empirical study that is presented in this chapter has drawn on online fieldwork next to staff interviews to continue an exploration of practices 'on' and 'beyond' user interfaces. Social topology, together with the premises of 'the ethnography of infrastructure' (Star, 1999) have been explicitly used to scrutinize the relational arrangements that are realized through this education initiative. The chapter particularly demonstrates the unique capacity of social topology to work *with* and *across* binaries, such as openness/closedness, continuation/disruption, and similarities/differences, and shows how these seemingly opposing properties manifest (in) the same forms and in varying gradients. In this vein, it shows how it moves beyond a dialectical position that supposes that something 'is' only by the grace of what it is not (cf. Freeman, 2020). The chapter further exemplifies how visualizations can be used to showcase the overlaps between different forms and formations, and how the elusive nature of infrastructuring practices can hereby be made visible. While the findings have surfaced the importance of the (topographical) localities of students in this initiative, the methods of empirical engagement and analysis have not yet been applied to tap into the specifics of their local settings. Considering the confidentiality of the 'closed' meetings of the students, it is important to devise empirical engagements in such a way that they allow engaging *with* involved students and teachers without intruding 'in' these confidential spaces (Tsai et al., 2020). Analytic techniques, in turn, will be developed to tap into the topographical locations 'in' which they learn, while also doing justice to the topological relations manifested through the platforms (Hartong & Piattoeva, 2019). This includes a method for visualization that leverages the possibilities for displaying bounded surfaces, while also showing the 'layeredness' of the different (topographical-topological) realities.

Chapter 5: Erasmus+ Virtual Exchange: interrogating nationalism[3]

It was in light of a research project on European online education that, in the fall of 2019, the research team had planned a three-day stay at a European university. The stay covered meetings with students, teachers, and administrators who were involved in the Erasmus+ Virtual Exchange (E+VE), a program called for by the European Commission (EC) to complement "physical" Erasmus exchanges with virtual (i.e. online) exchange activities that (inter)connect youngsters across European and Southern Mediterranean countries (see European Commission, 2017a). Research participants in the visited university were involved in one particular virtual exchange activity, namely the Virtual Exchange format developed by the Sharing Perspectives Foundation (SPF). This format integrates online video lectures, reading materials, and small-group dialogue sessions about political and intercultural issues into 5- to 10-week courses (Sharing Perspectives Foundation, 2019). Inspired by Law and Mol (2001), the purpose of the research stay was to query where it was exactly that teachers' and students' practices related to the Virtual Exchange were located. More particularly, we interrogated these local practices to understand whether and how this initiative actualizes the popular rhetoric about online learning that happens "anytime, anywhere" or whether these online practices were locally bound after all (see Sheail, 2018).

A Special Issue calling for studies about the re-appearance of nationalism in contemporary European education practices encouraged us to expand this interrogation. That is, we did not only question whether and how practices with the Virtual Exchange were bound to locations, but also whether they kept to borders of 'the nation'. By doing so, we considered the E+VE program as part of an ongoing

[3] This chapter is an adapted version of the publication:
van de Oudeweetering, K., & Decuypere, M. (2023). Interrogating "the nation" in European online education: Topological forms and movements. *European Educational Research Journal*. Advance Online Publication. https://doi.org/10.1177/1474904122114823

European policy call for 'transnational' education initiatives, that is, initiatives that extend state-led education systems and that involve collaborations among students, teachers, and organizations across national borders (European Commission, 2018, 2020a). These policies are specifically oriented towards fostering a 'European identity' and, more recently, towards a European Education Area (EEA) *'[. . .] in which learning, studying, and doing research would not be hampered by borders'* (European Commission, 2020a, p. 89). Hence, it can be said that the E+VE program is positioned within a broader transnational policy framework that challenges civic nationalism, including the claim on the nation-state as the (only) legitimate provider of education and its responsibility to nurture a national identity. In a similar vein, it can be argued that E+VE confronts cultural nationalism, especially because it intends to foster intercultural and politically sound dialogue among young people from (non-)European countries and thereby deals with implicit, discursive, and/or symbolic borders between 'insiders' and 'outsiders' (see European Commission, 2017a). While the European Commission thereby approaches digital technologies as flexible tools to overcome borders related to geographical distances and national juridical frameworks (European Commission, 2017c), we recognize that nationalism does not necessarily disappear when educational practices are shifted to online platforms. That is, we learn from existing scholarship about the historical formation of "the nation" and the role of education herein that nationalism often persists through local education practices, including instruction in the "mother tongue," historical narratives, and imageries like flags and maps in classrooms (e.g., Balibar, 1990; Piattoeva, 2009). Moreover, we acknowledge that such local practices could continue through online platforms initiated by the European Commission, as their interface design often covers particular (default) language options and symbolic imageries (van de Oudeweetering and Decuypere, 2019). Nevertheless, there is little research that shows how these platforms are used by teachers and students in their local settings, and whether these local practices challenge, continue, or introduce (new) forms of nationalism. From this point of view, the call of this Special Issue gave a new impetus to our research, as it encouraged us the

problematize the lack of knowledge about possibly unnoticed forms of, or challenges to, nationalism throughout online European education initiatives. While this shows our concern for the continuation of nationalism in education in general, this chapter explicitly takes a stance toward the need for knowledge about the current implication of nationalism in online European education to ground normative discussions about its possible consequences. In this vein, the chapter is driven by an aim to provide empirical descriptions, theorizations, and methodologies to recognize (new) forms and movements that support or challenge nationalism through online European education initiatives.

While pursuing this knowledge, we built a theoretical-conceptual framework based on two strands of literature: critical border studies and social topology. Both challenge the idea that nations can only be understood as flattened-out "given" topographies. Critical border studies have a more established practice of dealing with issues regarding nationalism and have already denoted how transnational (policy) relations do not necessarily lead to a "*weakened condition of the nation-state*" (Minca and Vaughan-Williams, 2012, p. 768). More specifically, critical border studies have introduced the notion of bordering practices to highlight how borders, including those of the nation-state, may appear through new political and technological relations that are, similar to this case, recognized locally (Minca and Vaughan-Williams, 2012). Social topology is a transdisciplinary lens that takes a similar interest in those kinds of dynamic locally enacted relations that make up bordering practices. However, rather than recognizing nationalism by the ideologies implied in relations, social topology explores how nationalism is established through particular forms of relations that expand across multiple settings, including in the field of digital or transnational education (see Prince, 2015). Together, these strands of literature inspired us to build and characterize a typical national form, which is used to assess, challenge, or complement how nationalism comes about in the empirical setting of this study. This further guided the presentation of the findings, which detail how local practices with the Virtual Exchange format generate bordering practices that transform the "typical" national form into multiple national forms and leveled forms while they also produce

alternative spherical forms next to bouncing and tunneling movements. We end this chapter with a discussion of these various forms and movements while reflecting on the potential of emerging translocalities in countering nationalist discourses and practices.

Theoretical framework

Critical border studies

This chapter builds on critical border studies (CBS), a line of empirical, historical, and theoretical research with an established practice of interrogating nationalism by focusing on the relational enactment of borders. More specifically, rather than verifying borders as "given" demarcations of regions, CBS turn to bordering practices, which are *"understood broadly in terms of wherever and whenever a check is made on the mobility of people, services, and goods"* (Minca and Vaughan-Williams, 2012, p. 766). These "checks" include practices that are more often associated with national borders, like border patrols or visa applications, but they also relate to discourses (e.g. "us" and "them"), symbolic orders (e.g. flags, language policies), and local practices within nations (e.g. housing policies for migrants) (Minca and Vaughan-Williams, 2012). By illuminating the profusion and volatility of bordering practices, CBS thus show that borders are not merely topographical lines around regions but ongoing political, material, and technological processes within regions and between locations (Parker and Vaughan-Williams, 2012; Scott, 2020). In this regard, CBS problematize the use of topographical maps in and beyond classrooms as they, next to other practices like historical maps and linguistic standards, install bordering practices that support nationalism because they delineate "a" geographical entity that belongs to "a" people and "a" state (Balibar, 2004; Billé, 2018; Scott, 2020; see also Piattoeva, 2009). In other words, CBS highlight how topographical images render the idea that nations are typically fixed, singular, linear, and flat, while erasing the historical-political dynamics, the multiplicity of people, and the multidimensional infrastructures that constitute the nation too (Balibar, 2004; Figure 23).

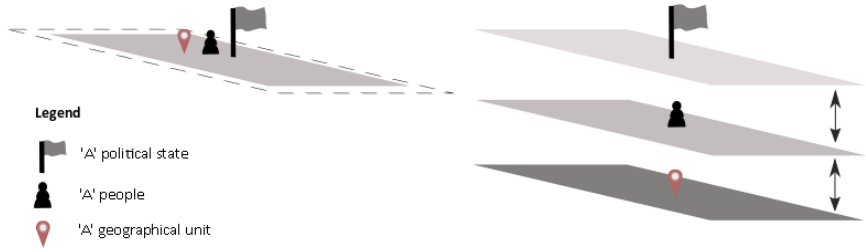


Figure 23. A presentation of typical national form with a legend. The image on the left side presents how bordering practices are positioned around "a" geographical unit, "a" people, and "a" political state, and thereby generate a singular, linear, fixed, and flat form. The image on the right side presents, using the double-sided arrows, how bordering practices are positioned between this geographical unit, people, and state. This right-side images thus dissects the topography of the nation and interrogates its flatness and singularity (cf. consisting of multiple overlapping surfaces) and linearity and fixity (cf. made through recursive interactions between geographical units, people, and units).

In this chapter, we want to show how these principles of CBS can complement and inform educational theory by singling out how specific educational practices reinforce the naturalization and singularization of "the nation," while also pointing at those educational practices that do deal with the multiplicities, dynamics, and multidimensionality of borders. By deploying CBS in this way, this chapter aims to give concrete examples of practices that instructional designers, teachers, and students can adopt to expose and go beyond continuing forms of nationalism, including in European education initiatives that are proclaimed not to be 'hampered by borders' (cf. European Commission, 2020).

Social topology, topography, and nationalism

This chapter combines these insights of CBS with social topology, a transdisciplinary approach that, similar to CBS, guides empirical inquiries into relational enactments (Decuypere & Simons, 2016; Prince, 2015). While social topology does not address ideological issues related to nationalism *per se,* it has been deployed in previous studies to scrutinize how 'the nation' persists as a *spatiotemporal form* made through relations in and across online and/or transnational settings (Savage & Lewis, 2018; Hartong & Piattoeva, 2021). In this sense, there are various overlaps between the premises of social topology and CBS. First, social topology shares with CBS the interest in relations

that translate into bordering practices (see also Mezzadra and Neilson, 2012). Second, similar to CBS, social topology challenges topographies as objective representations of nations. More specifically, it approaches topography as one possible form of space that produces a *fixed, linear, singular,* and *flat* constellation of (Euclidean) coordinates, indexes, and maps (Martin and Secor, 2014). This also means that social topology considers how topographies uphold *national forms* as they present bordered 'snapshots' that can be coupled to a particular name and state, while they do not account for complex movements (ibid).

However, social topology also shows various differences from CBS that make it a complementary lens to this chapter. First, it adds consideration for how bordering practices *generate* forms of space-time rather than delimit them (Mezzadra & Neilson, 2012). Second, it thereby deals with a broader range of *alternative forms* beyond topography. Specifically, it situates topographies among *topologies,* which are relations that hold together into *multiple, evolving, non-linear,* and/or *voluminous* constellations (Lury, Parisi, & Terranova, 2012; Thompson & Cook, 2015). This outlook has been important for studies that try to understand how concrete infrastructures (e.g., tunnels, bunkers, railways) (see Elden, 2014; Harvey, 2012) as well as expanding digital infrastructures (e.g., digital identification systems but also platforms) (e.g., Plájás, M'charek, & van Baar, 2019) materialize shifting, differential and sometimes less easily recognizable forms of European spaces and times for local or national communities. As such infrastructures come about through practices in/at/on/across topographical locations (i.a. countries, places, or 'sites'), social topology considers how topologies *imply* topographies, rather than oppose or exclude them (see also Williamson, Bergviken Rensfeldt, Player-Koro, & Selwyn, 2019). In this sense, social topology departs from the idea that European, national, and local topographies are neatly fitted 'layers' that communicate 'top-down' or 'bottom-up' (cf. Alexiadou & Rönnberg, 2021) but it doesn't assume a totally 'flat' ontology either: it considers how topographical and topological relations interact, fold, mix, and merge into various dimensions (Decuypere, 2021; Grommé & Ruppert, 2019).

A related contribution of social topology is that it helps to point to the specific *indicators* that bring these forms into being. In this regard, social topological studies have illuminated the importance of *standards,* like classifications, grades, or codes, that act as *topological* 'mediators' between local, national, and/or transnational (policy) spaces and times because they make connections across geographical distances without holding on to fixed topographical landmarks or tropes (Allen, 2016; Marres & Gerlitz, 2016; Hartong & Piattoeva, 2021). Prime examples of topological mediators are high-stakes test scores that connect local practices in schools with transnational policies while also affecting national policies (Hartong, 2016). This shows how social topology has established a new way of understanding how technologies like the E+VE format, could hold together as specific kinds of online transnational movements while being made through dynamic interactions across local settings (see also Hunt, 2017).

Another contribution of social topology on top of CBS is that the affiliated branch of transdisciplinary literature offers various theorizations of *typical topological forms* that can be recognized in *specific* empirical observations. This allows seeing how practices extend or continue across multiple settings without making universal claims, thus leading to a 'careful' generalization (Decuypere & Simons, 2016; Lury & Wakeford, 2012). At the same time, this also means that social topology hinges upon insights of discipline-specific studies like CBS to guide its attention to particular forms and to invoke typicalities *a posteriori*. For this particular study, this means that we draw on the combination of social topology and CBS to consider how *typical national forms* can be recognized next to alternative topological forms and movements.

(Alternative) topological forms and movements

By what is detailed above, we have shown how the combination of social topology and CBS allows seeing a multitude of bordering practices that produce spatiotemporal forms beyond the typical topographical rendering of the nation. In this paragraph, we give examples of alternative topological forms and movements, by what typical properties they can be recognized, and through what particular kinds of bordering practices. Notably, previous social topological studies have posited *networks* as

alternative topological forms which are recognized *multiple, immutable, and mobile* relations that are non-hierarchically ordered, hence, appearing on a *flat* plane (see also Law & Mol, 2001). These network forms constitute, for instance, Internet (infra)structures and public transport constructions, which extend topographical borders through the use of topographical indexes (i.a., maps, time schedules) and/or topological mediators (e.g., IP addresses and codes) (Elden, 2013; Hartong and Piattoeva, 2021). Other social topological studies drew the properties of *spherical* forms that, after Sloterdijk's conceptualization, include the *stability* and *multidimensionality* of topographical locations, while they are also constituted through *selective* and *semi-permeable* movements (e.g., welcoming guests while walling off against weather and intruders) (Ootes et al., 2013). For this reason, these spherical forms are mainly recognized in intimate places, like homes (ibid). Social topological studies also show how bordering practices do not always lead to coherent forms but rather constitute continuous movements 'between' transnational and local actors, or that 'bounce' between offline-online realities (Prince, 2015; Hartong and Piattoeva, 2021; van de Oudeweetering and Decuypere, 2020). Similarly, studies identified tunnels as movements because they enable *dispersed multidimensional (dis)connections* between localities and, hence, they do not hold on to a particular form (Elden, 2013). The combination of social topology and CBS thus provides this study with an array of typical forms and movements that are fruitful starting points to recognize relations emerging from online European initiatives as bordering practices. Nevertheless, it is only by detailing whether and *how exactly* these topological forms are made that it becomes possible to see how educational initiatives continue or challenge typical national forms, and how educational practices and policies can be designed and pursued accordingly.

Methodology

Based on the theoretical resources, the methodology for the empirical study sets out several *topological innovations* of traditional practices in qualitative research, including site and participant selection, data collection, data analysis, and interpretation. This

means that the chapter, next to its empirical goals, intends to make a methodological contribution to the literature about researching nationalism in current (online) European education. In what follows, we explain what these topological innovations implied for choices regarding concrete methods, and how the adopted methods attune to the dynamics, multiplicity, and multidimensionality of bordering practices (see also Lury & Wakeford, 2012). These explanations show how the methodology guided us in re-constructing topological forms based on our empirical encounters rather than directly representing the experiences of research participants.

Site and participant selection: Defining the setting

First, the methodology departs from the practice of 'purposefully selecting' research sites and participants to portray a 'given' research problem, because social topology considers how research problems are ongoingly generated through empirical encounters that make particular relations (visible) (Lury, 2021). By *defining the setting,* we approach the research site and participants as part of a wider ecology of (trans)national relations before and beyond the research and document *what* relations are acknowledged, and *how* they produce our research problem (Decuypere, 2021; Lewis, 2020a). In this case, this meant that were started reading *policy documents* about the E+VE program (European Commission, 2017a, 2020a, 2020b, 2020c). In light of the research problem, this demonstrated the research site as an entanglement of the transnational Virtual Exchange initiative and the principle of subsidiarity, which implies that national governments hold primary authority over the local education policy. Second, we explored *(online) materials of the SPF format* (Sharing Perspectives Foundation, 2020). Related to the research problem, these materials covered political topics, including nationalism and the borders of Europe. Moreover, the materials were ordered in weekly sequences in which learners had to (1) watch videos of experts, (2) write reflective comments about these videos, (3) participate in online moderated dialogues within a consistent, small group of students from different European or Southern-Mediterranean countries about topics in the videos, (4) and write reflective comments about the dialogue. The dialogues were conducted through a teleconference

tool developed by Soliya, another partner in the E+VE program. The interface design assembles displays of participants in a circle, centralizes a 'get the mic' button (which allows only one participant to speak at a time), and a 'general' chat function, while it also integrates a 'private' chat function. The teleconference tool is embedded in a platform that also has 'streams' and 'channels' through which participants can chat or post comments. Third, we consulted the *teacher-administrators* in the university to understand local arrangements. These consultations took place while preparing group interviews (cf. infra), which meant that the teacher-administrators were aware that their input was used for this study. What came forward, regarding the research problem, was that the Virtual Exchange format was part of their 'Internationalization at home' policy in the departments of Physics, Chemistry and Social Sciences. More specifically, students in these departments were given the option to register for the 10-week Virtual Exchange course as an alternative to obligatory, discipline-specific English language classes (for example, English for Physicists) on the condition that they passed an English proficiency assessment. Students who did not pass, or did not register at all for the Virtual Exchange, were following the regular 'in-class' English course in parallel. Registration and grading for the Virtual Exchange was enabled through a 'partner arrangement' with SPF which meant that students enrolled for the Virtual Exchange were graded based on attendance to the dialogues. To facilitate this, data about attendance was provided to the teacher administrators but no data available about the contents of their conversation, to retain confidentiality. Specifically, through the Virtual Exchange, students were connected to other participants who were not part of a partner arrangement and who could freely register for the SPF format when they fulfill the age- and country requirements (i.e. between 18 and 30 years, living or having nationality in a European or Southern Mediterranean country). This demonstrated the practices of the Virtual Exchange as a complex coming together of local, national, and transnational relations.

Data collection: recording

Inspired by previous social topological studies, we draw on *recording* as a topological innovation of more traditional (ethnographic) methods of data 'collection', like observational fieldnotes and interviews (Ceulemans et al., 2014; Sheail, 2018). That is, recording centralizes a topological sensitivity for the interactions between participants, researchers, and instruments and protocols, and how these *produce* data in a particular form rather than that they allow data 'out there' to be collected. For instance, as will become clear in the findings, accounts of participants are documented as responses to questions that are posed by the researcher rather than as standalone stories. Moreover, field notes about the spatiotemporal setting are made (e.g., what classrooms, libraries, and campus buildings look like, and how are students positioned in class) to understand how these co-constituted the accounts. Considering the importance of these arrangements, research participants were consulted in the process of recording. First, teachers were consulted to understand the local adoption of the Virtual Exchange and to understand their roles as teachers and administrators (hence: teacher-administrators; cf. supra). Second, teacher-administrators were asked to help arrange *group interviews* with students. We collaboratively formulated interview questions that, ultimately, covered (the use of) the SPF format and its technologies, the location and time to 'do' dialogue sessions, and comparisons with 'regular' classroom practices and Erasmus exchanges. Moreover, teacher-administrators organized a suitable place and time (i.e. a reserved classroom during lunch breaks; midway in their Virtual Exchange experience), invited students to participate in these interviews via email (by announcing them as voluntary 'feedback sessions'), and co-guided the first two sessions. During the first group interview, over twenty students participated while there were respectively four and eight students during the second and third sessions. At the start of each group interview, the researcher introduced herself as a PhD researcher from another European university, explained the purpose of the interview, and inquired for written consent for the (recording of the) interview from all participating students. Third, formal *individual interviews* with five teacher-administrators were conducted (four on-campus, and one online). These interviews

(ranging from 35 to 70 minutes) started with inquiring for informed consent and were audio-recorded and transcribed. Topics addressed during the interview were based on what was not yet elaborated upon in the previous consultations (i.a. responsibilities, motivations, interactions with students, and university policies regarding the Virtual Exchange).

Data analysis: specifying

In terms of analysis, the methodology involved a topological innovation of coding strategies because, from a social topological angle, codes operate as 'standards' that produce new relations and, hence, new bordering practices. In that vein, we start by *specifying* relations in the empirical setting without attaching new codes but by focusing on indicators (i.e., topological mediators and/or topographical indexes) in the empirical setting (cf. supra; Lury & Wakeford, 2012). Concretely, the analysis started by highlighting fragments in the interview transcripts and fieldnotes that materialized bordering practices, following the general definition of activities that put a 'check' on movements (Minca & Vaughan-Williams, 2012, p. 766). After that, we analyzed what topological mediators or topographical indexes, tropes, or names generated these bordering practices and whether they evolved into (dis)connections. For instance, European credits (ECTS) were recognized as topological mediators that allowed connections between transnational and national education policies, while it generated disconnections from non-European policies (cf. Hartong, 2016). Next to this, country names were considered topographical indexes that established connections between people (e.g., a girl from this region) or politics (e.g., elections in this country) but also disconnections between places, people, and politics (e.g., 'non-European people', 'situations different from us'). Important to note is that topographical tropes were only used *if, when,* and *how* they emerged from the empirical encounters, rather than relying on them as the only indicators, to do justice to the way that topographies and topologies might be intertwined (Mezzadra & Neilson, 2012). Reflective memos were written about whether and how these (dis)connections established coherent forms or ongoing

movements until no new (dis)connections were found. Finally, the noted (dis)connections were integrated into *descriptions* that array who or what gave account during the recording (i.e. the research participant or researcher), how exactly these were narrated or conveyed (e.g. through explicit examples or quotes), and the methods that prompted these practices (e.g. interview questions, observations).

Data interpretation: typifying

Finally, by *typifying* these specific descriptions, the methodology introduces a topological innovation of practices of interpretation. That is, the research follows the topological idea that practices should be theorized in terms of how they continue typical properties across different settings without 'fixing' and 'unifying' them into one universal claim (see Decuypere & Simons, 2016; Lury & Wakeford, 2012). In this case, typifying started by stipulating the *relational* position of bordering practices (e.g. around, between, over). These relational positions were rendered through *visualizations,* which present how bordering practices intertwine and thereby constitute forms and movements without falling back on topographical tropes (see Decuypere & Simons, 2016). For instance, these visualizations integrate flat surfaces to present bordering practices that enact the two-dimensionality typical to topographical forms but also ingrate folded surfaces that show voluminosity, dynamics, and multiplicities among bordering practices. These folded surfaces thus operate within the tradition of topological methodology where folds stand for *transformations* in the constitution of spaces-times (Lury, 2021). The visualizations also include arrows and lines to highlight these movements, and legends and captions to support the reading of these movements in the visualizations (ibid; see also van de Oudeweetering & Decuypere, 2020). These captions act in consonance with the textual accounts that stipulate *typical properties* like (im)mobility, multiplicity or singularity, (non-)linearity, and two- or multidimensionality. These properties are, in turn, used to invoke existing theorizations of (topological) forms and movements (cf. Theoretical-Conceptual Framework). While this still produces 'fixed' and bordered accounts, the idea is that the complex coming-together of descriptions, visualizations, and theorizations allows

new connections with existing literature, thereby moving beyond a piecemeal and ahistorical description of this particular case (Decuypere & Lewis, 2021).

Findings

The following five sections present, consecutively, three forms and two movements that were generated through the methodology. The first two sections stipulate two forms that showed properties of typical national forms, while the third section lays out alternative, interwoven forms. The fourth and fifth sections set out movements that mingled with the previously established forms and that, in this vein, confused them.

Multiple national forms

When students were asked, in the group interviews, what they had learned through their involvement with the Virtual Exchange format, they initially did not refer to their English language class but primarily mentioned that they had learned about *'political stuff', [..] that we don't have in science'* [Group interview 1]. This 'stuff' entailed concepts like nationalism, populism, and patriotism as well as recent events, including protests, conflicts, and elections in Europe and beyond, that were explicitly addressed in the videos of the Virtual Exchange. Through these examples, students made *(dis)connections between political situations and regions.* For example, students associated 'good', 'easy', and 'stable' situations with 'European countries' or 'perspectives from the inside', while difficult and less stable situations were related to 'non-European countries' and 'perspectives from the outside'. Students highlighted that they learned most from stories of their fellow participants in the dialogue sessions: *'Because sometimes you just don't know how the country works, then it's just the name on a map. [..] maybe it's not like, a good representation of how the people are living there, but at least it becomes possible to see how young people from my age [group] could feel in such a place.'* [Group interview 3]. This exemplifies how students made *connections between participants and regions,* which was also visible in references like 'the Finland girl', 'a guy from Syria', and 'we, here, in our country'. Students also told that the videos in the Virtual Exchange raised the

question 'where are you local?'. Through the dialogues about these videos, they made *connections between people and multiple* regions, including accounts of an Australian guy living in Austria, a European girl raised in South America, and students who moved from their 'home town' to their 'university city'.

These descriptions stage how the use of topographical indexes, particularly names for countries and regions, continued throughout practices with the Virtual Exchange format. On the one hand, these topographical indexes engendered disconnections and bordering practices *around* people, regions, and states. On the other hand, by coupling participants and regions, these topographical indexes produced connections and bordering practices *between* geographical units, people, and political states. In this vein, the descriptions show how practices with the Virtual Exchange format continue the *linearity, stability,* and *flatness* of typical national forms through the use of topographical tropes (see Figure 24a; Balibar, 1990; Billé, 2018; Scott, 2020). Nevertheless, when students were encouraged to consider their connections to *locations*, more linkages were made that challenged the *singularity* of nationhood (see Balibar, 2004). More specifically, references to multiple affiliations with locations give rise to *multiple national forms* that are generally not visible in dominant political (and nationalist) discourses (see also Law & Mol, 2001; Figure 24a). This 'topological multiplicity' generated possibilities for seeing how participants were connected *translocally,* i.e. across their locations, rather than merely transnationally (see Sheail, 2018).

Leveled forms

When teacher-administrators were asked about how they integrated the Virtual Exchange format into the curriculum, they answered that they had to make several "fits." First, to get the format integrated into a pilot project in their Master's program, they had to make connections between transnational standards of Virtual Exchange (ECTS-system and 10-point scale evaluations) and national standards (credits by hour investments and 20-point scale evaluations). To file for long-term accreditation, they had to make connections between the transnational Virtual Exchange format and their

national accreditation form. Specifically, while the Virtual Exchange started every semester, their national policy stipulated that accreditation would occur once every 3 years through a formal application procedure. At the time of the research stay, the teacher-administrators were filling out a formatted proposal for the upcoming application deadlines. This proposal included a timeline with work packages and deliverables that 'fitted' with objectives of the transnational E+VE program, their "in-house" Internationalization at Home policies, and the national regulations regarding curriculum standards. Considering this tight formatting and the long timeline of the accreditation cycle, one teacher-administrator stressed: "you know, we're not the most agile institution, but I don't think that the universities are agile anywhere" [Interview 5].

These descriptions foreground the (re-)emergence of "the national" and "transnational" as topographical tropes that effectuate disconnections, and bordering practices around different (policy) regions. At the same time, the descriptions show how standards (i.e. ECTS, evaluation scales, work packages, deliverables) operate as topological mediators that enact connections, and bordering practices between the transnational format, national regulations, and the local policy of the university, making them 'fit' together (see also Hartong, 2015). Hence, while topographical tropes appeal to the singularity, stability, linearity, and flatness of typical national forms, the topological mediators introduce multiple, recursive, and multidimensional relations that make these topographies continuously connected to each other. This generates leveled forms, which are folded surfaces that do not imply a "top" and "down" side as if the transnational precedes and/or superimposes the national and local (see Figure 24b; cf. Alexiadou and Rönnberg, 2021). More specifically, the descriptions show how leveled forms are built through the work of "local agents of change" with standards, which generates a composition of relations that remains intact when stretching over different distances or timelines (see also Hartong and Nikolai, 2017). In this vein, these leveled forms show how "the national" and "transnational" are ongoingly made counterparts through translocal connections (Sheail, 2018).

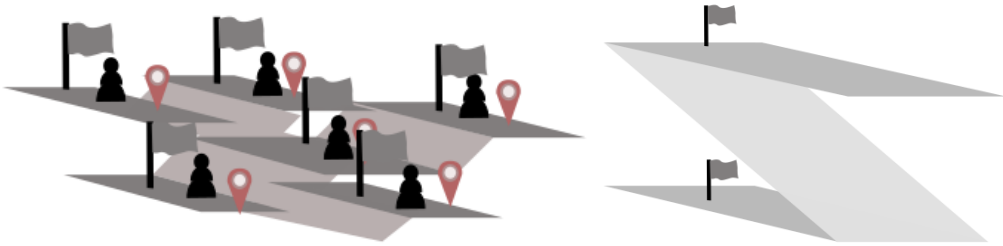


Figure 24a (on the left). This visualization demonstrates how multiple national forms are made. Topographical tropes generate bordering practices around and between political states, persons, and geographical units, which initially leads to fixed, flat, linear surfaces (see one "person" instead of "a people" that is related to one geographical unit and state; see Legend of Figure 24d). By establishing multiple connections between people and locations, the surfaces become folded, which shows the enactment of multiple national forms.
Figure 24b (on the right). This visualization renders how leveled forms are made. The "flags" designate the topographical tropes that generate bordering practices around political states or entities (i.e. the national, the transnational; see Figure 24d for Legend). The folds of the surfaces illustrate how standards generate bordering practices between political states or, in other words, how they enact topological mediators that allow surfaces to "fit" onto each other. Through this parallel folding of the (trans)national political entities, this presentation counters the "natural" and singular status of the nation.

Spherical forms

Upon questioning students about how they organized a location for their practices with the Virtual Exchange, they commonly expressed that they could choose to do it 'anywhere'. Nevertheless, they listed several conditions for making *(dis)connections with the online and offline environment*. Particularly, the first precondition was to have an access point to (stable) Internet and a digital device with a microphone and a camera. Second, students said that they often needed their reflective assignments, some preparatory research, and a pen and paper at hand. Third, students recurrently mentioned that they needed to 'close' their setting to retain the focus on, and confidentiality of, their dialogue sessions. They did so, for example, by shutting a door, by warning room- or housemates not to enter, or by using a pair of headphones. Some students said that, while keeping to these preconditions, they changed their location throughout the course, depending on where they were at that moment. For example, students 'did' dialogue sessions at the airport (with headphones on) or at their parents'

or friends' place (warning them not to come in). The university, however, was not a favorite option: "*Because I can move my computer, it's here.. so eh.. it happened that I had the choice between doing a meeting at the university or.. at my apartment and I chose my apartment because at the university I don't have a place where I am certain that there will be nobody that will come here, during two hours."* [Group interview 3]. Although field notes during the research stay substantiated that most rooms on the campus could not be 'closed' (i.a. computer labs, libraries, and cafeterias were all publicly available), teacher-administrators also pointed at rooms that were made available for the online dialogues, including a 'fish tank' (i.e. a quiet room in the computer lab surrounded by glass) and library offices (i.e. closed with a key, that could be retrieved from the reception). While students did not mention these on-campus places, they also said to favor their home as a location for the dialogue sessions because of the comfort of having cozy furniture (mainly a bed), food, and drinks at their disposal. This made the Virtual Exchange a 'convenient' option to do their English language course and made the dialogues feel like an informal and private conversation. Students as well as their teachers confirmed that this was an easier, and possibly less scary, way to have an intercultural exchange than a 'physical' Erasmus. Or, as students attested: *"it's a.. just behind the computer so we don't have to travel to meet these people and people there will stay at home too, and we can speak with them. It's all so very.. easy"* [Group interview 2].

These descriptions effectuate the Virtual Exchange as a composite of topographical locations and topological relations. That is, while the topographical locations are made manifest through bordering practices *around* local settings (i.a. doors, headphones, warning signs), topological relations appear through bordering practices that mediate *between* these closed locations (cf. internet connections, assignments). While the places for 'doing' the dialogue session appear as *multiple* and *stable topographical locations,* they are not flat nor linearly defined: rather, they are *multidimensional, semi-permeable,* and possibly *moving and variable spherical forms* as they can shift across different situations and selectively 'let in' those connections of the Virtual Exchange while warning others out (cf. Ootes et al., 2013; see also Figure 24c).

As comes forward from these accounts, this allowed students to have confrontations with people from other nations while keeping to the comfort and intimacy of their homes. This shows how digital technologies do not only 'inflect' intimate places, but they enact particular forms of intimacy (Marres, 2017). Moreover, it shows how off-campus learning is not necessarily 'inferior' to on-campus practices, but generates new ways for universities to reach out to students across different locations and to generate spaces and times that allow for 'opening up', thereby manifesting themselves as *translocal* universities (Sheail, 2018).

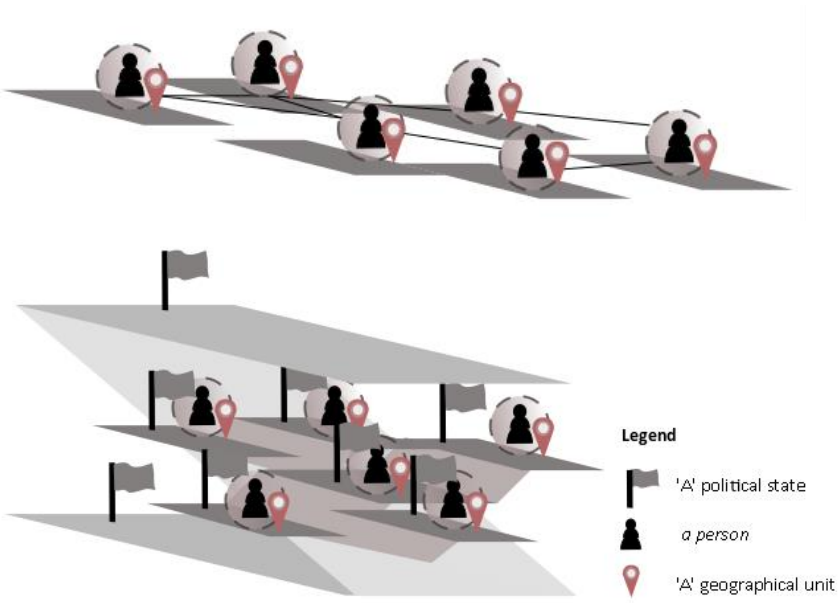


Figure 24c (on the top). This visualization presents how spherical forms are made. The surfaces show how the local practices initially appear through stable bordering practices around topographical locations. The gradients in the circles show how bordering practices operate in a multidimensional way (i.e. in homes rather than flat topographies), while the dotted lines around the circles illustrate their semi-permeability. Finally, the lines between the surfaces delineate bordering practices between the people and the locations made through recursive interactions with Virtual Exchange.

Figure 24d (on the bottom). This visualization brings multiple national forms, leveled forms, and spherical forms together. This shows how the relationships between political states, personal affiliations, and geographical locations are complicated and multiplied, challenging the singularity, linearity, stability, and flatness of a typical national form. Because these forms are specially made by bringing together people, things, and places from different regions, it shows how the engagement with the Virtual Exchange prioritizes making and recognizing connections rather than articulating delineations.

Bouncing movements

When students were asked about the (digital) technologies they used in the Virtual Exchange, they detailed several *(dis)connections from, with, and among technologies.* First, they generally said that they connected to meeting rooms (i.e. the teleconference tool) of the Virtual Exchange platform, while they barely used chat channels and streams on the platform. Rather, they connected to other platforms that were 'more user-friendly' to 'share more media' (e.g. articles, videos) with their peers throughout the week. Furthermore, students mentioned that there were various 'technical issues' during the synchronous meetings, like difficulties with logging in, failing video or audio functions, or erratic Internet. Besides introducing temporary disconnections from the platform, these technical issues rendered *connections between technologies and regions,* as students said, for instance: *"In Europe, the connection is great, but in Algeria and Syria it is bad, they have a lot of problems. [..] it is part of the country to have connection problems"* [Group interview 1]. Some students also mentioned *(dis)connections between themselves and places or persons*: they said that they lacked a 'full experience' of the countries of their fellow participants and felt like they could not 'see the whole person'. One student exemplified: *'You don't live in the… in another country, you stay in your room.. and when the session is over you come back to your life'* [Group interview 3]. This constant 'coming back' to their life was integrated into their assignments, which involved interviews with local peers that are, in turn, shared and discussed in the dialogue sessions. In this way, they constantly integrated 'feedback' from their online *and* local environment which worked, as one participant said, *'like a match of ping pong'* [Group interview 2]. Some students said that coming back to the same group every week generated 'a sense of proximity' or felt like 'being in a mini-universe'.

These descriptions materialize a complex interweaving of topological and topographical relations. First, the mix of different technological features and platforms generates bordering practices *between* and *among* digital technologies that, in turn, enable multiple and flexible online movements (see also Thompson, 2016). Next to this, the technological connections manifest bordering practices *between* topographical

localities as distant people and places are drawn 'closer' into a 'mini-universe' (see also Allen, 2016). However, because students never 'rest' in a place, i.e., only see 'parts' of another place and then come back to their lives, these connections never reach a stable form in themselves. Rather, their engagement with the Virtual Exchange engenders *multiple, variable and recursive movements* that constitute typical 'bouncing' movements (cf. like a match of ping pong) (van de Oudeweetering & Decuypere, 2020). This generates possibilities for students to be constantly 'on the move' across different localities, rather than in a single country as 'regular' Erasmus Exchange would do. In this constellation, the involvement of the nation as a political state seems to fade away (see Figure 25) and the emergent connections between participants enact their *translocalities* (Sheail, 2018).

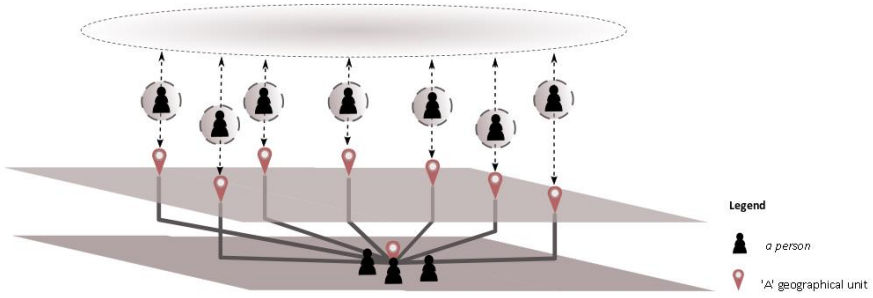


Figure 25. This visualization assembles bouncing and tunneling movements. The upper circle with dotted lines illustrates the "mini-universe," that is, the sense of proximity between Virtual Exchange participants generated throughout the Virtual Exchange. More specifically, it shows how it is established through bordering practices between and among technologies and persons. The vertical arrows, running through the "spherical forms" (see Figure 24c), present the recursive movements between topographical locations and persons, established through technologies. Together, they show how bouncing movements are variable, recursive movements that do not solidify "a" form as such. The two overlapping surfaces present how bordering practices around the topographical location of the campus and bordering practices between topographical locations of Virtual Exchange students (i.e. their homes) are established "on top" of each other. The thick lines show how bordering practices between the campus and the homes of students are made by teacher administrators and their unrecognized work on the Virtual Exchange, that is, their tunneling movements that establish connections while remaining relatively invisible. What is remarkable throughout these movements is that, in contrast to forms, they do not (re-) materialize the demarcations of the nation as a political state. These visualizations thus show what is difficult to explain: how continuous movements enact specific kinds of bordering practices while foregoing others.

Tunneling movements

When teacher-administrators were asked about their educational responsibilities, they initially explained that they made *connections between their students and the Virtual Exchange* through their administrative tasks. That is, they had promoted the Virtual Exchange format at the start of the semester, facilitated the English assessments and registration, mediated when technical difficulties arose and, finally, 'fitted' the grades with the local standards (see also Leveled forms). They said to do these tasks 'on top' of their regular workload, and managed these responsibilities and their on-campus classes 'side-by-side', while their work for the Virtual Exchange was not officially recognized nor remunerated. Teacher-administrators thereby regularly mentioned *disconnections from the Virtual Exchange*: while some said to keep track of the weekly reflective assignments of their students in the Virtual Exchange, they were not allowed to attend the dialogue sessions for purposes of confidentiality. This meant that the feedback sessions (i.e., group interviews) were the first moment that the teachers heard about their Virtual Exchange activities. Accordingly, they repeatedly said to feel like an 'outsider' from the Virtual Exchange, and more of a 'mentor' or 'guide' for their students. Moreover, one teacher-administrator acclaimed '*..[It] doesn't give us a feeling of being European or global or.. [..]it's only that we sort of send them [the students] off on the Virtual Exchange or Erasmus, [..] but as a teacher or administrator, all of this has a very local feeling to it'* [Interview 4]. The teacher-administrators also noted that the Virtual Exchange engendered *disconnections among students*. That is, Virtual Exchange students were generally more confident in speaking English than peers who followed the 'regular' classes – re-affirmed by the results of the English assessments. Moreover, they continued practicing their English through the dialogue sessions at home, while their peers remained on campus. To counter this, some teachers devised plans to *generate connections among students* through, *'[..] for example, interviewing the local students for their project, things like that, so that it's not so very different for these different groups.'* [Interview 4].

These descriptions illustrate another set of interwoven topographical-topological relations effectuated through practices with the Virtual Exchange. First, the noted

disconnections and the statement about students being 'sent off' establish bordering practices *around* the campus. That is, they stress the campus as a central topographical location for their teaching and studying practices while the Virtual Exchange happens 'elsewhere' (Bayne et al., 2014; Sheail, 2018). Second, by positioning responsibilities for the Virtual Exchange and English classes 'side-by-side' or 'on top' of each other, teacher-administrators generate bordering practices *between* their tasks: as teachers, they are present *in class* while, as administrators, they connect to Virtual Exchange students *outside of class* (see also Ross & Sheail, 2017). This shows how teachers establish (dis-)connections between topographical locations in a multidimensional, non-linear way (i.e., working 'on top' and 'side-by-side') and without holding on to a particular form, which displays the typical characteristics of *tunneling movements* (cf. Elden, 2013; see also Figure 25). Given the 'local' feeling attached to these movements, this suggests that these engagements can be considered *translocal* connections that engender new ways for universities to reach out ánd to open up to students beyond the campus (see also Sheail, 2018).

Discussion

This chapter was inspired by empirical encounters with students and teacher-administrators who engaged with an online European education initiative, namely the Virtual Exchange format of the Sharing Perspectives Foundation (SPF). While the initial purpose was to interrogate whether and how their practices substantiated the rhetoric of learning 'anytime, anywhere' or whether they were actually locally bound, this Special Issue's call prompted us to query whether and how these practices continued or challenge national(ist) or transnational relations too. The theoretical, conceptual, and methodological resources of social topology and critical border studies (CBS) guided a focus on bordering practices that were generated through students' and teachers' engagement with the Virtual Exchange format. Moreover, these resources were deployed to evoke a *typical national form* that can be recognized by singular, stable, linear, and flat bordering practices. This form was integrated into a methodology that sets out several topological innovations to scrutinize bordering practices across a

variety of situations within the empirical setting. Particularly, through this methodology, the chapter reconstructed three topological forms and two different movements that (re)produced, changed, and complemented this typical national form.

The findings of the chapter do not yield a single, definite answer regarding 'where' practices of students and teacher-administrators in the Virtual Exchange are situated – either within local, national, or transnational borders. Rather, they show complexities that make the engagements with this initiative far from straightforward extensions of (trans)national policies and topographies. First, the findings illuminate how typical national forms were (re-)materialized through the use of topographical indexes and tropes like country names, 'the national', and 'transnational' policies. Nevertheless, they also show how students made multiple affiliations to topographical locations, which gave rise to *multiple national forms* that challenged the idea that one person is belonging to one country (Balibar, 1990). Moreover, the work of teacher-administrators with standards illustrated the emergence of *leveled forms* that do not prioritize the 'transnational' or 'national' but generate more complex, locally enacted constructions (cf. Billé, 2018). Next to this, as students made 'closed' places (e.g., at home, by shutting a door) to do their dialogue sessions, their practices generated *spherical forms* through which they could connect to other, more distant, locations in an intimate way (Ootes et al., 2013). Furthermore, *bouncing movements* were generated through students' connections between their online 'meeting room' and their offline realities (e.g., their room, and their local peers). This allowed them to continuously move and come 'back' while learning about the differences they encountered (see also van de Oudeweetering & Decuypere, 2020). Finally, *tunneling movements* were enacted as teachers-administrators established connections with, among, and between students and the Virtual Exchange across different topographical locations without holding on to a single form, which allowed the university to reach out and open up in new ways (Bayne et al., 2014; Elden, 2013).

By rendering local practices with an online European education initiative into different topological forms and movements, this chapter adds to the literature that

interrogates the vision of a 'denationalized' Europe that is 'unhampered' by borders (e.g., Grommé & Ruppert, 2019). That is, on the one hand, the chapter displays how topological relations in online settings generate bordering practices that continue typical national forms and shows the important role of topographical tropes herein (Savage & Lewis, 2018). On the other hand, this chapter demonstrates how the same topological forms engender and illuminate multiple relationships to topographies that go beyond the unity of people, geographies, and political states, and thereby challenge the 'natural status' of the nation (Balibar, 1990, 2004). In this vein, this chapter demonstrates how combining theoretical repertoires of topography and topology in educational settings could support a more critical engagement with the implications of 'the nation' and its form. More specifically, the topological forms and movements in this chapter substantiate how online learning could generate different relations that are not necessarily inferior to on-campus learning (Bayne et al., 2014; Ross & Sheail, 2017). One argument that is built throughout the chapter is that the forms of relations generated through the Virtual Exchange encourage *translocalities,* which are connections across different *specific* locations (see Sheail, 2018). Translocalities thereby evoke a conceptual framework that, as an alternative to 'transnational activities', accentuates how people connect across distances and differences without appealing to the 'nation' and its stable, linear, flat borders that need to be overcome. In this sense, a conceptual framework that integrates translocalities could engender new kinds of discussions among researchers, policymakers, and educational practitioners about the arrangement of virtual exchanges. For instance, it could guide discussions about the conscious and cautious use of topographical tropes next to topological standards to encourage more complex, layered, and dynamic images of people, countries, and politics. This could inspire teachers in various settings who are increasingly expected to teach online to consider whether and how they pursue or challenge nationalism.

Besides contributing to literature about nationalism in contemporary (online) European education, the chapter also makes a *methodological* contribution to researching nationalism. Particularly, the chapter has drawn on existing research that has experimented with social topological methodologies to tap into the implications of

intertwining local, national, and transnational education policies (Decuypere & Lewis, 2021; Gulson et al., 2017; Savage & Lewis, 2018). Next to this, the chapter has built on CBS, their definition of bordering practices, and their concrete empirical examples of these practices. These resources allowed this chapter, in the analysis, to recognize where and by who or what borders were re-installed. Third, and finally, through the combination of social topology and CBS, the chapter has been able to develop a typical national form and define its typicalities (Billé, 2018). This particularly allowed the chapter to roll out a topological method of interpretation, i.e., typifying, which explicates how different theoretical repertoires can be connected to understand whether and how transnational, online, practices could emulate and/or transform practices more broadly affiliated with national(ist) tendencies. This means that the methodological contribution of this chapter is expressly about bringing these methodological, theoretical, and empirical resources together, and 'attuning' them to this emerging research issue.

Although contributing to the research as such, the methodology is not without limitations. The (three-day) timeframe of the empirical encounters and the fixed format of this chapter generates a report that gravitates toward a 'snapshot' topography. Moreover, descriptions and typical forms are developed by the researchers, while they may not be recognized similarly by all research participants or by participants in other European online learning settings. However, by relating the empirical setting to the wider environment of (trans)national policies, thus by defining its setting and its *own* borders, this chapter aims to account for some of its inevitable reductions. Moreover, we want to stress that this chapter is not the 'end' of this inquiry and re-invoke developments of research about online education and European policy that run through this research. This means that the chapter attends to the way that national forms come forward *today* and *in this particular university* while inviting other people to discuss their possible evolvements, including the role of transnational and national policies, digital technologies, institutions, educators, and students herein. We

thereby stress that, indeed, thinking in terms of translocalities may guide us in starting such discussions.

What does this chapter say about European Open Education?

By examining how practices with the Erasmus+ Virtual Exchange format of SPF continue and/or challenge nationalism, this chapter taps into the intersection of questions about openness, education, and the involvement of European policies. First, it addresses the question of European involvement as it shows how this initiative manifests the imperative of 'strengthening a European identity' (European Commission, 2017c). More specifically, this study shows how topographical tropes in this education initiative reinforce Europe as a new kind of 'nationhood' that attaches people to a *single* region – creating an 'us' living in Europe and a 'them' *not* living 'here' (see also Balibar, 2004). However, the study also shows how topographical tropes challenge nationalism when they point to multiple relations between people and locations (e.g., an Australian guy in Austria, a Syrian person in Sweden). Next, the study relates to the question of openness as it shows how particular closures, in this study denoted by 'bordering practices', allow students to 'open up' to *other* locations (Sheail, 2018). More specifically, it shows how 'being local' does not mean being closed or unreachable as long as it comes along with relations that deliberate 'translocal' connections. This feeds into the educational implications of this case study, which expand on the possibilities for students to learn through and about differences in opinions, situations, and people through the E+VE program (see also previous chapter). This case study especially shows how *locally involved* educational actors – institutions, organizations, teachers, and students – are encouraged to think, go, and connect beyond the hegemony of topographical thinking. Whether and how educational actors continue this through European online education initiatives is, therefore, a topic for further scrutiny.

What does this chapter say about the (developed) methods?

This chapter has aimed to set out methods that integrate the enactment of topographies into a social topological analysis and, thereby, to expand on the repertoire of analytical tools. In doing so, empirical engagements that tap into local practices of students and teachers 'with' the user interfaces are trialed (see also Decuypere, 2021). To present the ideas and practices that informed this work, this chapter includes an elaborate section about the 'topological innovations'. This section demonstrates how, in this case study, the methods to document practices 'on' and 'beyond' the user interface are moved from the main sources of information to means to 'define the setting'. As the study considers that the setting is not a 'background' but part of the research problem (cf. supra), this shows how these methods can be reassembled for different purposes without losing their relevance for the research (see also Lury, 2021). The interest in the enactment of topographies surfaces in the innovations of data 'collection', analysis, and interpretation. Informed by Critical Border Studies (CBS), these innovations prioritize tracing (dis)connections between people, places, and topographical tropes – which are rendered into overlapping forms. While the conceptual repertoire suited the specific problem of interest, it called into question whether *educational* tropes could be invoked and re-articulated in social topological analysis. For instance, can institutions, teachers, and students be examined in terms of *how* they manifest online education? The strength of social topology lies again in making results insightful through a combination of descriptions and visualizations that stage the complexities of (temporarily) 'fixed' indicators and continuous changes. What is to up for further exploration is whether it is possible to make the methodological work 'on' the user interface palpable through protocols, i.e., lists of 'rules' that do not necessarily 'fix' the empirical engagements but that provide guidelines to show what social topological research actually means in *practice*.

Chapter 6: OLS and Blend-in: Navigating in times of crisis?[4]

As a territorial, political, monetary, and educational alliance, Europe has faced several crises that led to ongoing conflicts about, and changes in, its borders (e.g., Börzel & Risse, 2018). When it comes to *education,* European policies have generally remained constant, as it has steadily kept to the 'European project' of creating a European Education Area (EEA) '*in which learning, studying, and doing research would not be hampered by borders'* (European Commission, 2017c, p. 11). Accordingly, successive Erasmus programs have pursued 'cross-border' student exchanges and university collaborations (European Commission, 2020d). More recently, these programs are also coupled with online learning initiatives, following the rationale that these online efforts aid the transcendence of educational practices over national jurisdictions (European Commission, 2018). Moreover, these online initiatives do not clash with the principle of subsidiarity, as they are non-legislative instruments that allow national governments and institutions to hold principal authority over education policy (European Commission, 2017c). In this sense, these online learning initiatives appear to enact the European project in a particular way.

At the same time, broader European policies have also appealed to online learning initiatives to remediate crises in a more timely and temporary manner, and often with other interests regarding the borders of Europe. For instance, to deal with the so-called 'refugee crisis', the European Commission (EC) devised an action plan with quick measures – including online learning initiatives – for the integration of 'third-country nationals'(European Commission, 2016). Unlike initiatives in the Erasmus+ program that encourage and arrange cross-border exchanges, these crisis-

[4] This chapter is an adapted version of the publication:
van de Oudeweetering, K., & Decuypere, M. (2022). Navigating European education in times of crisis? An analysis of socio-technological architectures and user interfaces of online learning initiatives. *European Educational Research Journal*, *21*(6), 922-945. https://doi.org/10.1177/1474904121105900

remediating initiatives are devised as a means to 'manage' unplanned border crossings. Furthermore, these crisis-remediating initiatives are financed in urgency and for a fixed number of three to four years, which contrasts the long-term planning of intermediate Erasmus+ programs. This shows how these online learning initiatives perform different European policies, with different spatial and temporal implications for (the borders of) Europe.

This study builds on literature that approaches such initiatives as *policy actors* that generate (visions of) European education spaces (e.g., Lawn, 2001; Romito et al., 2019), rather than passive tools that allow people to connect across a 'given' European space. In doing so, the study aims to expand on this literature by addressing the related but relatively underacknowledged research concern of how these European policy initiatives manifest particular *times* too (see also Barbousas & Seddon, 2018). This means that the study intends to understand how European online learning initiatives, linked to the project of a 'borderless' EEA and/or the 'refugee crisis', introduce new forms of spaces *and* times for European education. In its address to this question, this study focuses on two exemplary online learning initiatives that are funded by the EC. The first initiative, called Online Linguistic Support (OLS), is a platform that was initially developed for Erasmus exchange students but also included refugee students within a timeframe of three years. It is, for these reasons, initially approached as a policy actor that is explicitly related to the long-term project of the EEA as well as to the remediation of the refugee crisis. The second initiative, named Blend-in, is a mobile application that addresses refugees and their support workers, and that has been funded for a fixed period of two years. Therefore, it is initially approached as a policy actor that is explicitly related to the remediation of the refugee crisis.

In what follows, the theoretical-conceptual framework of this study is set out. Social topology is thereby positioned as the main thread that guides a focus on the role of bordering practices in the enactment of European spaces-times, with explicit attention to the operations of digital technologies in recent European education policies. Drawing further on the literature on socio-technological architectures and user interfaces, the theoretical-conceptual framework lays out the argument that

navigations on user interfaces constitute concretizations of bordering practices. The chapter continues by setting out the methodological design, which centers around active navigations on user interfaces of the online learning initiatives. Two consecutive sections present findings for the two online learning initiatives, including descriptions and interpretations of different stages in the navigations. Finally, the discussion addresses the initial research aims and considers how the theoretical and methodological positioning of this study allows research(ers) to engage with European education, its bordering practices, and its related forms of space-times through the enactment of projects, crises, and crisis remediations.

Theoretical-conceptual framework

Social topology and bordering practices

The theoretical assumptions of this study are based on *social topology*, an approach that inspired various fields of research to examine the intricacies of borders, space(s), and time(s). Social topology departs from an understanding of borders as stable, unequivocal delineations cutting up a 'given' space, and rather considers borders as practices that produce spaces and times (e.g., Mezzadra & Neilson, 2012). By acknowledging these practices (henceforth: *bordering practices*) as ongoing and in movement, social topology integrates temporal and spatial implications of borders and relates these to different *forms*. For example, 'topographical bordering' is considered a practice that makes space frozen in time, and thus generates spaces in static forms of nations, territories, or regions (Hartong & Piattoeva, 2019). Other bordering practices, like policies involving international mobility and transnational exchanges, are understood for their temporal evolvements. For instance, these policies deploy 'projects' to bind together consecutive plans, and thereby create a continuously changing and 'risky' future vision an integral part of present education practices (Decuypere & Simons, 2020; Vanden Broeck, 2020). As these temporal evolvements imply that European education spaces are continuously morphing, i.e., forming as ecologies rather than as 'static' institutions, this shows the production of flexible spaces-*times* in European education (ibid).

Social topology is previously applied to consider the role of digital technologies – allowing interactivity and dynamics at scale – in the materialization of ongoing bordering practices and changing forms of Europe (e.g., Grommé & Ruppert, 2019). Particularly applied in the field of migration studies, it inspired studies to illuminate how digital technologies in European border management engender multiple forms of Europe that especially change in their encounters with 'different' people (M'charek et al., 2014; see also Pollozek & Passoth, 2019). That is, such studies have pointed at the digital identification systems at 'hotspots' on the edges of European territory that allow for continuous monitoring, selection, and steering of 'who' can go 'where' (ibid). At the same time, these studies have addressed how these border management systems are installed by appealing to a 'crisis', as an emergent situation that requires the temporary management of movements (van Reekum, 2019). Against the background of the long-term project of an EEA that 'is not hampered by borders', it shows a two-speed Europe that separates trajectories for refugees and migrants from those of 'natives' (Grommé & Ruppert, 2019). Moreover, it shows the production of *personalized* forms of Europe – changing based on the data of people in digital border management systems – and *particularized* forms of Europe – showing different pictures of Europe to different audiences (van Reekum, 2019).

The appeal to crises in changing forms of Europe is not only recognized in migration studies, but also in studies on education policy and practice. That is, European education policies have increasingly invoked 'crises' (i.e., the financial, the health) to argue for urgent changes, often through the use of digital means (European Commission, 2020c; see also Mangez & Vanden Broeck, 2020). The overarching rationale is that digital technologies generate more flexible forms of education that would allow educational institutions and learners to respond to changes in society and to continuously *renew* themselves (ibid). This rationale is important to understand the role of online learning initiatives as *policy actors,* that is, as agents that are intended to enact particular forms of space-time – flexible, renewable, and differentiated. At the same time, as policy actors, they are not passive tools and they may generate forms of space-time beyond their imagined scope.

Socio-technological architectures

To scrutinize these online learning initiatives as policy actors involved in the enactment of the forms of space-time, this study directs its gaze toward their *socio-technological architectures*. This gaze is deployed for four reasons, with fourfold implications. To start with, it involves a recognition of their *technological architectures* – how their technical features are arranged as a website, platform, or app – as this is important for understanding their spatiotemporal implications (e.g., Helmond, 2015; Light et al., 2018). That is, a technological architecture of a website consists of 'fixed' HTML arrangements that are not personalized per account. Differently, the architecture of a platform is characterized by constant data exchanges that make them 'agile' (i.e. constantly renewed), interoperable (i.e. connected to other platforms), and personalized (i.e. adjusted presentation of information based on personal data) (ibid). Architectures of apps either emulate the 'fixed' website arrangements or 'agile' platform operations but, what makes them specific, is that they are necessarily built to be compatible with operating systems of larger tech companies, their hard- and software, and their models for data exchange (see Light et al., 2018).

Second, the focus on *socio*-technological architectures means a recognition of the involvement of people (i.a. web designers, tech companies, and users) without whom these initiatives would not (continue to) operate. Moreover, the involvement of people materializes the political implications of online learning initiatives, as they involve different interests and negotiations in action (see also Williamson, 2018). For instance, because web designers integrate data submission forms at pivotal moments during online navigations (i.e., require to 'register' to continue), they install 'obligatory passage points' that set preconditions and limitations to 'where' and 'when' users can go online (Poell & Van Dijck, 2016; cf. Callon, 1986). Hence, by setting these conditions and by gaining and deploying data of users, tech companies and organizations emerge as new authorities (ibid). Illuminating the work put into making online learning initiatives thus allows surfacing the negotiations, decisions, and interests involved in their design (Light et al., 2018). It hereby becomes possible to approach online learning initiatives ás policy actors.

Third, the focus on socio-technological architectures guides this study in its interest in *forms.* That is, while social-technological architectures integrate 'flexible' digital data infrastructures (i.e., they streamline data flows between different organizations), they 'hold together' in a specific way (cf. Sellar, 2015). This means that they, in contrast to infrastructures, establish a characterizable 'form' of practice (Light et al., 2018; cf., Decuypere & Simons, 2016). The work of Bratton (2015) illustrates this through the image of the socio-technological architecture as a *multi-layered form and an envelope form*. As a multi-layered form, social-technological architectures are brought together through *(user) interfaces* – mediating layers that arrange interactions between users and the work of big tech companies and (non-)governmental organizations (cf. supra). In this sense, user interfaces establish bordering practices *within* social-technological architectures *per se* (see also Galloway, 2012; Drucker, 2014). As an envelope form, social technological architectures structure 'inside' and 'outside' relations – similar to the outer shell of a building – as it makes (hyper)links with 'external' organizations. For instance, platforms mark their 'own' interface design with a logo, while allowing other organizations to advertise through links. These images render how socio-technological architectures make up forms that are mutable and, hence, can change according to the decisions and negotiations of the involved people. This showcases, again, their political implications.

Fourth, the focus on socio-technological architectures concerns their materialization of *spaces* and *times.* Particularly, this study follows the arguments of November et al. (2010) who draw on user interfaces as mediators between users and (producers of) technologies. First, they approach visualizations on user interfaces (e.g., pinpoints on maps, hyperlinks) as references to the 'lines of production' – the involved people and organizations. Second, these references on user interfaces set up *navigations* that, through their dynamic engagement, generate multiple spaces-times (November et al., 2010). That is, how a user follows hyperlinks defines what they do and see (about an organization), which establishes their 'online world'. This means that navigations on user interfaces concretize how socio-technological architectures set up bordering practices that produce spaces-times – which also defines their role as policy actors.

Methodology

In what follows, it is explained how this study has set out *navigations* as part of its methodological design, which includes a purposeful selection of online learning initiatives, a navigation protocol, and a process of building analytic reconstructions.

Research terrain

Based on the conceptual framework, the purpose of the methodological design was to select online learning initiatives supported by the EC, with at least one directly related to the long-term European 'project' (i.e. encouraging bordering crossing, financed through Erasmus+ program) and one positioned as a 'crisis remediation' (i.e. managing bordering crossings of 'third country nationals' and financed through a temporary and urgent finance scheme). Another purpose was to select initiatives that cover different technological architectures, including at least one platform, website, and app.The selection started by exploring MOOCs4Inclusion, a 'catalog' resulting from an EC-commissioned study that maps existing online learning initiatives for migrants and refugees (see Colcucci et al., 2017). It includes a PDF document that presents all mapped online learning initiatives through short introductory texts and standardized tables with indicators (i.a., 'launching date', 'duration', 'target audience', 'purpose', 'financing model' (see Vrasidas & Miliou, 2019). Furthermore, an *interactive* catalog is presented on a website (https://moocs4inclusion) with computational filters that allow searching within particular categories (i.a. 'MOOCs' 'online courses', 'apps'). The first selected initiative (Online Linguistic Support, henceforth: OLS) was filed under the categories 'MOOCs' and 'online courses', and encompassed a website and a platform. In the catalog document, indicators stated the launching date (July 2016), duration (3 years), purpose (language learning), target audience (refugees), and funding scheme (Erasmus+). Furthermore, an introductory text stated that it was also included in a long-term program for Erasmus exchange students, while temporarily including refugee students. Accordingly, OLS was considered to be directly related to the European project, as well as implemented to remediate the 'refugee crisis'. The second selected initiative (Blend-in) was found

under the category 'app' but was presented together with a link to a website. The catalog further specified the launching date (November 2016), duration (ongoing and from November 2016–November 2018), purpose (social inclusion), target audience (refugees, migrants, and support workers), and financing program (Erasmus+). Based on this information, the initiative was related to the remediation of the refugee crisis. Together, these two initiatives set up a *research terrain* that allowed scrutiny of overlaps (i.e., crisis remediations; website architectures) and distinctions (i.e. European project, and app or platform architectures) (see Table 1).

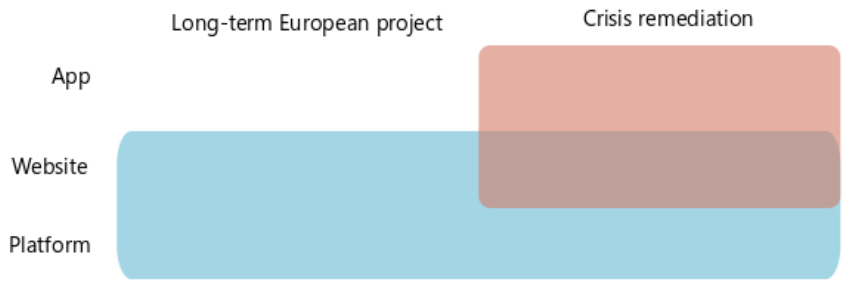


Table 1. The two selected initiatives (blue = OLS; red = Blend-in) are mapped in a 'research terrain', which demonstrates overlaps (OLS & Blend-in include crisis remediations and websites) and parallels (OLS as related to the European project and a platform.

Navigation protocol

The methodological design further included a protocol for navigations to guide the process of data collection. This protocol was informed by the 'walkthrough method', originally set up to analyze user interfaces of apps (Light et al., 2018). The walkthrough method inquires researchers to take the position of a 'regular user', while interchangeably slowing down to interrogate the socio-technological architecture making up these interactions (ibid.). This means that the method supports the theoretical-conceptual framework of this study, focusing on the amalgam of architectures, user interfaces, and navigations. The walkthrough method further informed the study to distinguish three 'stages' in navigations (i.e. registration and

entry; everyday use; suspension, closure, and leaving). Coupling these three stages to two modes of navigation (regular user interactions and slowed-down interrogation), a navigation protocol was developed that consisted of six 'parts' (see Table 2).

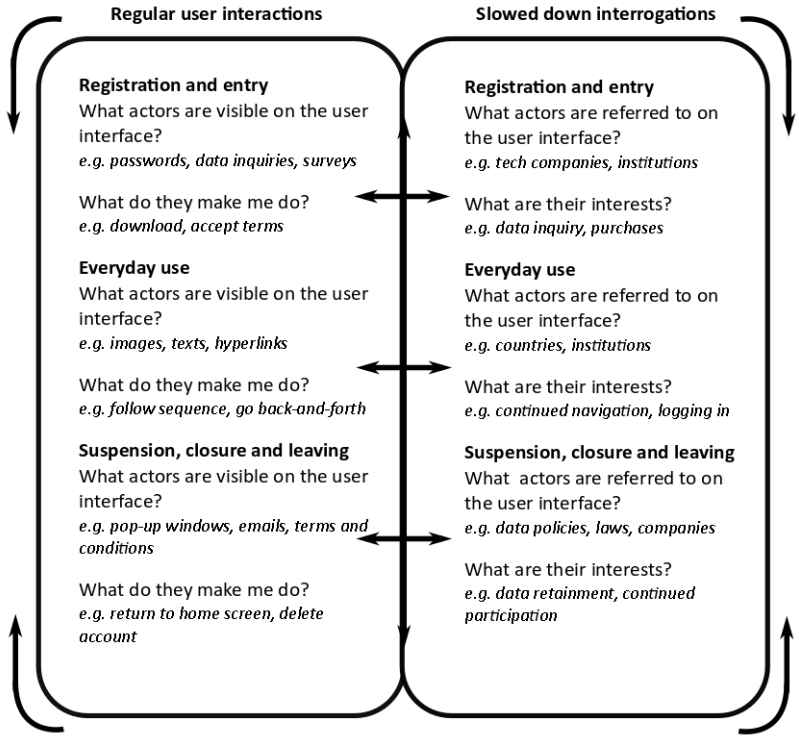


Table 2. Overview of the navigation protocol, organizing six 'parts' of the active navigations, while following these different parts interchangeably.

This navigation protocol was taken up by the first author to guide active navigations through the selected online learning initiatives. Queries for 'regular user interactions' directed her focus during navigations, and were recorded through a series of screenshots, audio memos, and (digitally) written memos. 'Slowed down interrogations' structured her reflection after the navigations, and were recorded separately through digitally written memos. Together, the screenshots, audio memos, and written memos comprised the data that informed the analysis.

Reconstructions

The analyses focused on making *reconstructions* of navigations. These reconstructions implied, first of all, *highlighting* pieces of data resulting from 'regular user interactions' (i.e. screenshots, audio fragments, memos). Based on the theoretical-conceptual framework, these highlights purposefully singled out references on the user interface that guided navigations and thereby concretized bordering practices. The highlights were made through iterative cycles of reading the data while writing reflective memos to guide a critical gaze on this process. Second, the reconstructions implied textual and visual *descriptions* of the 'regular user interactions'. That is, textual descriptions were focused on (relations between) references on the user interface (i.a. (hyper)text, icons), while visual descriptions comprised screenshots and sketches of the user interface that showed how these relations were made. The logic of the assemblage was deployed as a methodological tool to render relations between references *as* navigations and to address the coherence of navigations beyond a (seemingly) successive order. In this way, we intended to do justice to the social topological angle in this study (see also Ceulemans et al., 2014). Third, reconstructions implied *interpretations* of the assembled navigations. These interpretations link together the descriptions, the data of the 'slowed down interrogation', and theoretical resources, to bring the role of the socio-technological architecture(s), their bordering practices, and resulting forms to a conceptual understanding. The following two sections present reconstructions, each starting with a brief portrayal of the online learning initiatives as they come forward in (policy) documents. Subsequently, these sections present reconstructions by *registration and entry, everyday use,* and *suspension, closure, and leaving* as stages in the navigations, with descriptions and interpretations following up on each other. A visual-textual overview gives an account of interpreted bordering practices and forms (see Table 3), to support comparison across stages and online learning initiatives. Visual and textual accounts allow non-linear readings of this chapter, and thereby aim to do justice to the social topological complexities of the navigations.

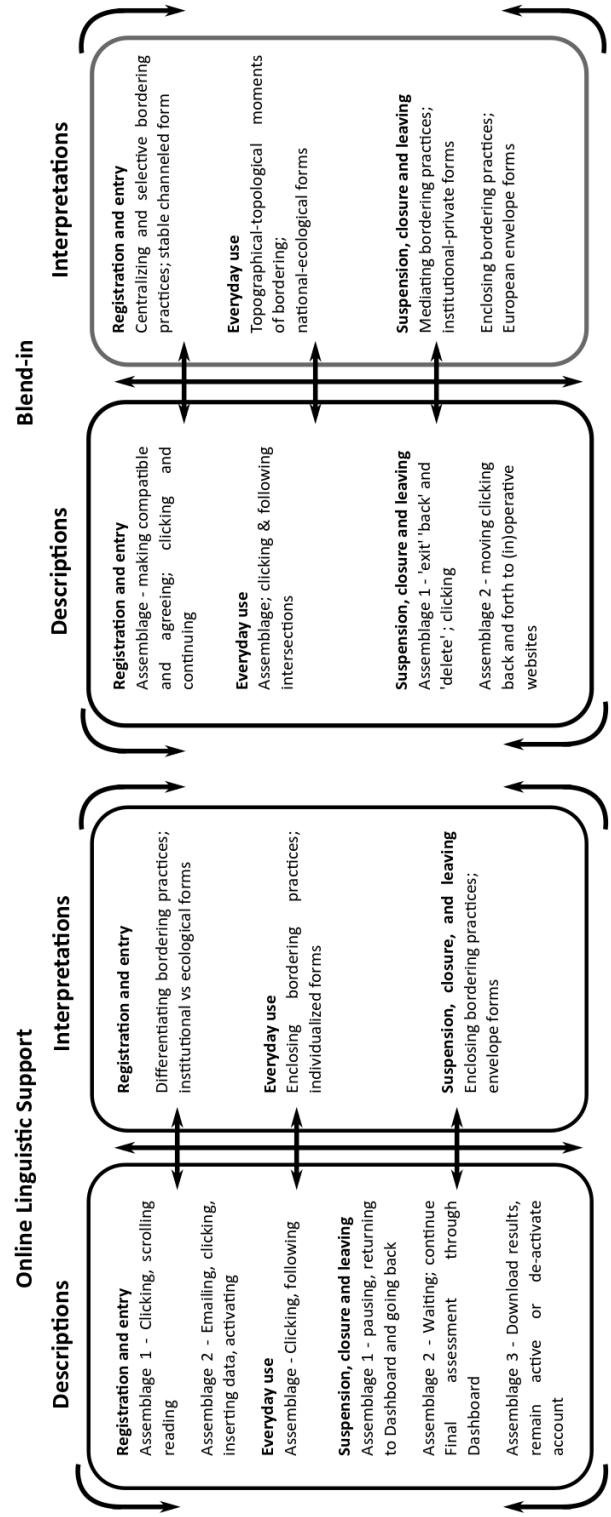


Table 3. A visual-textual overview of bordering practices and forms that resulted from the interpretations of navigations on the user interfaces of, respectively, OLS and Blend-in, organized by the different stages of the navigations.

Online Linguistic Support (OLS)

The first selected initiative, Online Linguistic Support (OLS) was characterized as a policy actor in the long-term European project, as well as in the remediation of the refugee crisis (see Table 1). The Erasmus+ Programme Guide aided an understanding of its relation to the European project, as it explained how OLS provides obligatory language assessments for Erasmus exchange students to test their (improvements in) language proficiency before and after their 'mobility activities', and optional online language courses to support language learning throughout the mobility period (European Commission, 2020c). The document further explicated that 'sending' higher education institutions authorize access to the OLS platform through 'assessment licenses' or 'course licenses' that they give to students. These licenses also allow them to keep records of students' achievements on the platform.

The MOOCs4Inclusion catalog and undergirding study gave insight into the relation between OLS and its remediation of the refugee crisis (Colcucci et al., 2017; Vrasidas & Miliou, 2019). This document explicated that a maximum of 100.000 licenses was made available for refugees across Europe within the timeframe of 2015 and 2018. These specific licenses were also disseminated by higher education institutions and included, by default, an obligatory first language assessment, an optional final assessment, and access to courses, for a maximum duration of 13 months.

Active navigations for this study were performed through an 'assessment license' for Erasmus Exchange students and were spread over two sessions. The first was conducted in August 2019, and covered initial exploratory navigation through OLS, its registration procedure, and a 'first assessment'. The second session was conducted in December 2019 and covered the final assessment as well as a (re)investigation of the entire website and platform. As the dissemination of licenses for refugees had stopped from 2018 onward, navigations through these licenses could not be examined.

Registration and entry

The first assemblage of navigations was centered around the 'home page', based on the main URL (https://erasmusplusols.eu/en/, the English language format). Clicking on tabs 'About OLS' and/or 'OLS for Refugees' in the menu bar led the navigation to pages with new texts and images, providing (additional) information about the initiative. Among other things, text on the 'About OLS' page stated that Erasmus exchange students should contact their coordinator and that they, consequently, would receive an invitation email to activate an account for this platform. Text on the 'OLS Refugees' page stated that supporting organizations for refugees should contact the nearest institution to communicate the email addresses of interested candidates and the language(s) they wish to study. This was accompanied by a map with 'location markers', which led to contact details of relevant institutions (see Figure 26). Starting from this map, a new assemblage of navigations was made, including an email correspondence with the institutional administration that was positioned as the nearest institution on this map (i.e. the affiliated university of the researcher). Through this correspondence, a license (for assessments and without courses) was granted to the research team, initially set in English but changed to French upon our request. The license was materialized by an invitation email with an 'Activate your account' button. Clicking this button led the navigation to a series of registration pages that presented empty data entry boxes (i.a. name, gender, date of birth, nationality, mother tongue, country of destination, and start- and end-date of mobility) and pre-filled data (email address, affiliated institution, 'type of mobility' and 'learning language'), all by default in English (see Figure 27). Furthermore, it included a checkbox to agree with the 'Terms and Conditions', concerning the liability, copyright, and code of conduct on the platform. The privacy statement, in turn, was accessed through an outgoing hyperlink and this demonstrated that data were treated according to GDPR, and were used for communication and research purposes on part of the platform itself, as well as the European Commission. The registration was finalized when all data entry boxes and this check box were filled and a blue button 'Save' was clicked, which lead to an overview of the inserted data in a 'Mobility Dashboard'.

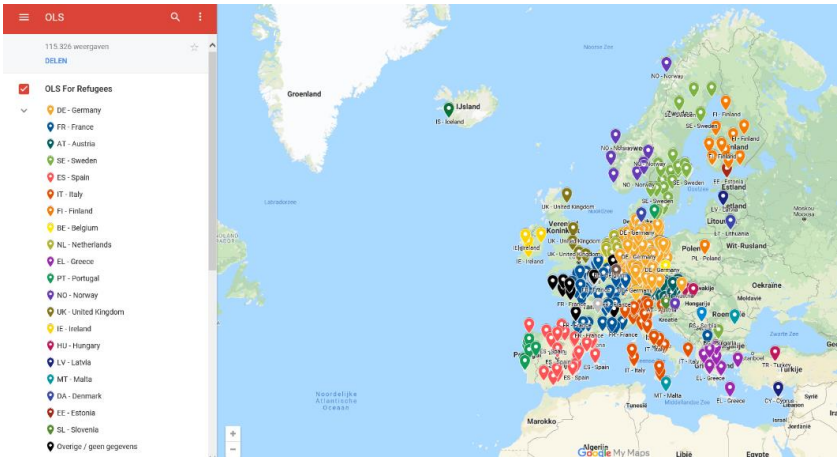


Figure 26. This map is presented in the 'OLS for Refugees' page during the navigation in August 2019. The markers on the map link to all institutions that distribute licenses to access OLS. When clicking on a pin, contact details of the related institution appear on the left panel. The left panel is also organized through computational filters, which filters markers of all 'OLS for refugees'-related institutions (captured in this screenshot) or only of 'National Agencies'.

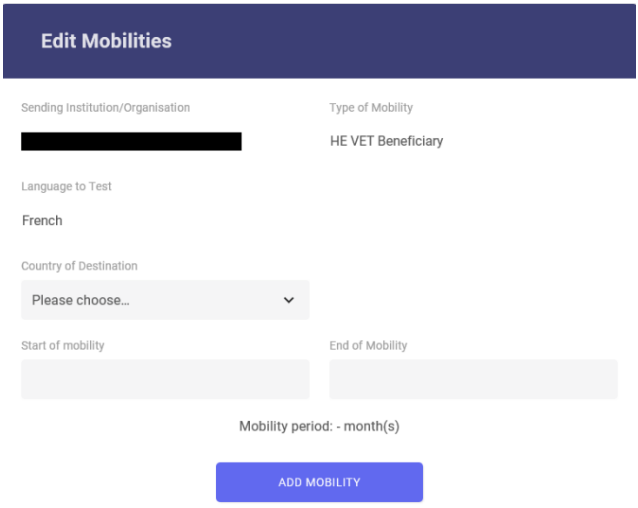


Figure 27. Screenshot of the second registration page (i.e. 'Edit Mobilities') in a series of three pages, made from the personal account of the first author. It shows the pre-filled data entry boxes (sending institution/organization, type of mobility, language to test), as well as those boxes, inquired to be filled out. The sending institution is covered with a black marker.

The first assemblage of navigations stages a stable construction of hyperlinks, images, and text, which characterizes the technological architecture of a website (see Helmond, 2015). The second assemblage particularly demonstrates a transition toward a platform architecture, characterized by the transmission and processing (user) data (ibid). In both the website and platform architecture, the institution is positioned as an 'obligatory passage point', as it grants licenses and thereby determines where and when students go (see Poell & Van Dijck, 2016). Erasmus exchange students are thereby invited to actively co-construct their mobility: they can fill out their language, host country, and mobility duration. Refugee students, however, can only indicate their language of preference via their supporting institutions while the mobility duration and host country are set by default. This generates *differentiating* bordering practices (M'charek et al., 2014). Specifically, these bordering practices generate *institutional* forms of education for refugee students, as their trajectories are bound to the limitations set by the institutions themselves. At the same time, they generate flexible *ecological* forms of education for Erasmus Exchange students – whereby institutions retain their authority to grant 'opportunities' while the responsibility to give shape to educational trajectories is shifted to students and platforms (see Decuypere & Simons, 2020). In this way, OLS enacts a 'two-speed Europe (see also Grommé & Ruppert, 2019), that is still renewable for 'natives' while 'given' and temporary for 'others' during an emergency crisis.

Everyday use

The navigations of everyday use through OLS were arranged into an assemblage that is configured around the 'Start' button in the Mobility Dashboard (see Figure 28a; underneath the 'First assessment'). This button inaugurated a series of pages (i.a., explaining the assessment process, testing the audio function, arraying four different parts of the assessments), each time introducing a 'next' page with a blue 'confirmation' button (e.g,. 'I understand', 'Let's go' or 'Validate'). Throughout these

series of pages, a continuously stretching orange line on the top of the user interface showed the relative position towards the end of the assessment. The assessment was completed through a 'Validate' button, which led the navigation to a 'Results' page with a 'Continue' button leading back to the Mobility Dashboard. From this moment onward, the Mobility Dashboard included a statement about the optional language course and the availability of the final assessment (Figure 28b).

This assemblage demonstrates the features of the platform architecture, including its 'agile' and personalizing operations (i.a. continuously stretching timeline; updated and personalized Mobility Dashboard). In this constellation, the Mobility Dashboard operates as an obligatory passage point, as it is both the 'starting point' and 'endpoint' for the assessments. While the stretching line and the successive 'confirmation' buttons give the appearance of a linear timeline, the Dashboard thus actually structures students' movements in circles. What is striking is that these circular movements are operationalized through references to students' own achievements, displayed on the dashboard and quiz questions, but there are no interventions of institutions, teachers, peer students, or other educational actors. In this way, the position of the Mobility Dashboard in the socio-technological architecture is to establish *enclosing* bordering practices around learners, which generates *individualized* forms of education (Nail, 2016). Moreover, as the Mobility Dashboard builds on the differentiated licenses, the socio-technological architecture renders OLS into a policy actor that operationalizes the different spaces-times for Erasmus exchange students and refugee students on an individual level (cf. Plájás et al., 2019).

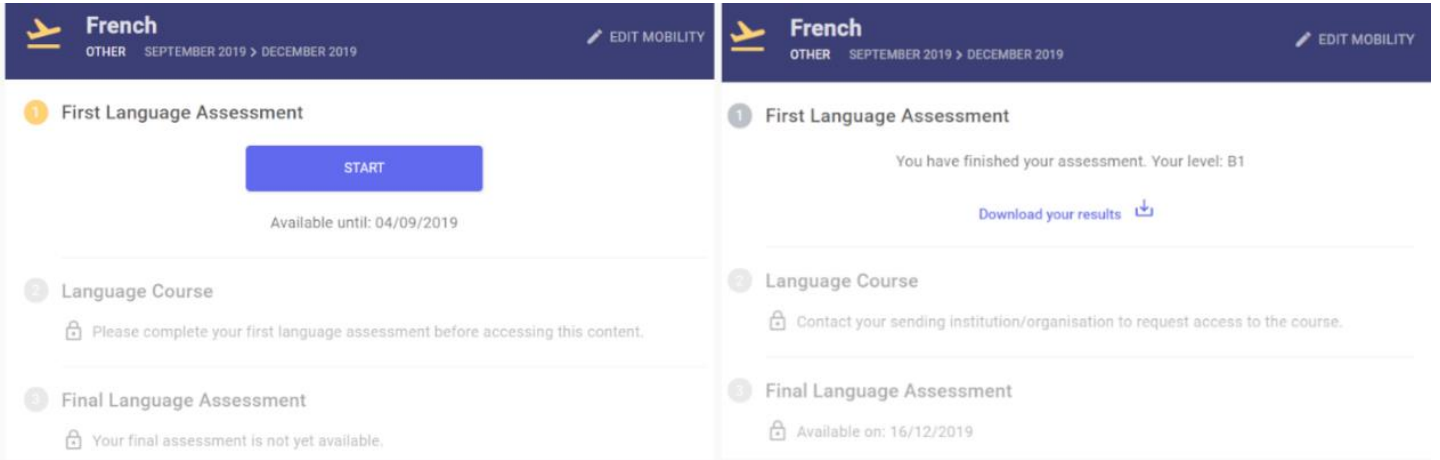


Figure 28a. On the left side is a screenshot of the Mobility Dashboard before the first assessment.

Figure 28b. On the right side is a screenshot of the Mobility Dashboard after the first assessment. The 'Start' button has disappeared, the orange circle in front of the First Language Assessment is shown in grey, the level resulting from the assessment is shown and a PDF document with the test results can be downloaded. The text for the next two steps has changed, saying that the sending institution needs to be contacted to request access to the language course, and the availability date for the final language assessment is shown.

Suspension, closure and leaving

Navigations that enacted suspensions, closures, and/or leaving were arranged into three assemblages. The first assemblage was continuously performed throughout assessments, especially by a small cross on the upper right corner of each question page. Clicking this cross yielded a pop-up window ('Progress will be saved for 15 days'), with a hypertextual button ('OK') that led back to the Mobility Dashboard. From here, the 'First assessment' was pursued through a 'Continue' button. The second assemblage was operationalized through the 'frozen' Mobility Dashboard in between the first and final assessment when no hyperlinks could be clicked (Figure 28b). Only at the indicated end date of the 'mobility', an email with a link to the Mobility Dashboard was sent, which showed that there was an operable 'Start' button underneath the 'Final Assessment'. A third assemblage, which specifically enacted *closure,* evolved around the 'Validate' button in this Final assessment. As all assessments were finalized, the only possible activities in the Mobility Dashboard involved clicking the 'Download results' button. According to the 'Support platform', the Mobility Dashboard would remain accessible in this format for at least 13 months after logging in, which would mean that the account was still 'active'. Moreover, the Privacy Statement explicated that personal data would be retained for 2 years and anonymized and aggregated data were stored for the whole duration of OLS, provided that the user did not ask for de-activation or deletion of the data.

These three assembled navigations demonstrate, again, the central position of the Mobility Dashboard as an obligatory passage point in the socio-technological architecture of OLS. As visible in these navigations, it structures when, where, and how navigations are suspended or continued, while continuously 'leading back' to itself (see Light et al, 2018; Poell & Van Dijck, 2016). As such, the Mobility Dashboard re-enacts *enclosing* bordering practices that, in these cases of suspension, have short- and long-term implications. That is, in the short term, the Mobility Dashboard acts as a reference to real-time records of students' achievements and simultaneously structures where/when they need to 'continue', thereby resulting in closed 'feedback loops'

(Decuypere & Simons, 2020; Williamson, 2018; see also Nail, 2016). In the longer term, data retainment policies show that the socio-technological architecture of OLS 'holds' (data of) users even when they move 'away from the screen'. These implications generate *envelope forms* that hold users' movements 'inside' even when they are moving 'outside' of the platform (Bratton, 2015; cf. Light et al., 2018). In general, this demonstrates how OLS is an online platform that generates closed and 'fixed' trajectories next to being 'flexible'. Particularly because Erasmus students can 'activate' their account by logging in, while the account of refugee students is closed after a default period of 13 months, this shows again how the socio-technological architecture of OLS continues a 'two-speed' Europe with extensive possibilities within a European project and delimited, fixed times of crisis (Grommé & Ruppert, 2019).

Blend-in

The second selected initiative, named Blend-in, was characterized as a policy actor in remediating the refugee crisis (see Table 1). To understand its relation to this policy, the website of Blend-in was consulted through the link in the MOOCs4Inclusion catalog (http//blend-in.eu/en/). On this website, a page titled 'Outcomes' presented hyperlinks that, respectively, led to the presentation of Blend-in an app store, the download of a PDF document with a handbook for support workers, and the download of two reports on the development of the app. The handbook stipulated that the app was purposed to support pre-departure and post-arrival orientation for refugees and migrants, especially in four countries (i.e. Greece, Italy, Malta, Cyprus). The two reports integrated a needs analysis and initial testing of the app. Another page, titled 'News', included several 'deprecated' hyperlinks, which could be attributed to the fact that funding had stopped in November 2018. After this initial exploration, navigations were decidedly focused on the app, the central outcome of the initiative, and operable although funding had stopped.

Registration and entry

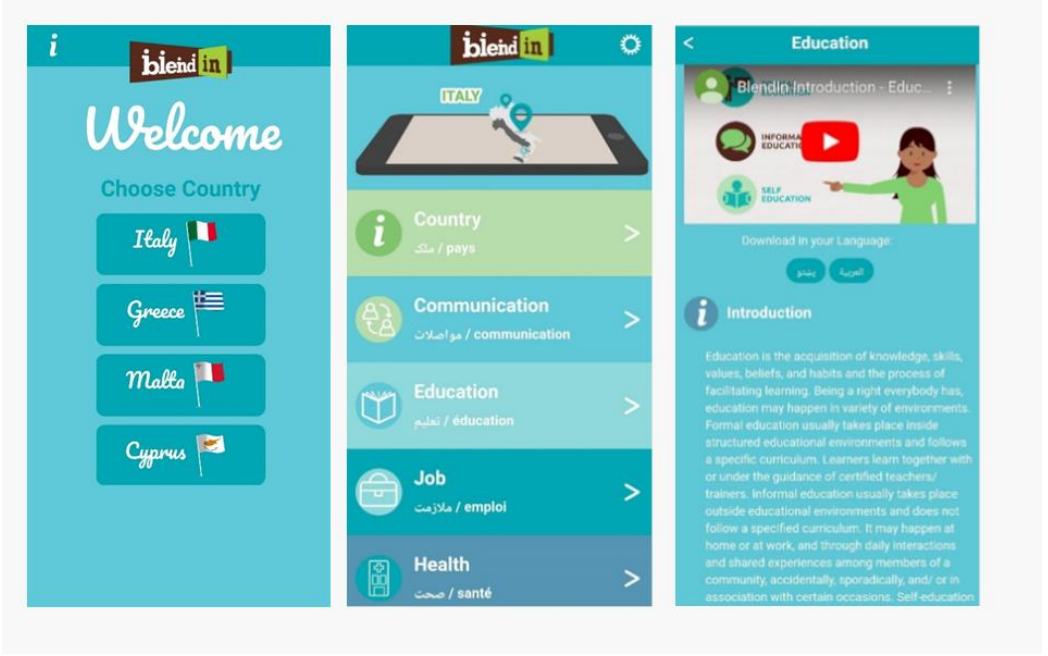
Entry into Blend-in was arranged through an assemblage centered around the app store, which was linked to one operating system (OS) and, therefore, urged navigations to continue on a compatible mobile device. The interface design of the app store displayed the Blend-in app through quantitative indicators (e.g. ratings, numbers of downloads), qualitative indicators (e.g. descriptions, visualizations), and categorical indicators (e.g. age ranking, category education) indicators. Moreover, only recently, this app store includes a tab about 'Data safety' which shows that no data is collected or shared with third parties. One of the few clickable hypertexts was the central 'Install button' that, after being clicked, changed into an 'Open' button and led to the 'Welcome page' of the app. After that, navigations were pursued without registration or a link to a personal account.

This assemblage of navigations materializes the app architecture, including its reliance on a particular OS and, thus, particular devices (Light et al., 2018). As a result, the socio-technological architecture positions (products of) related tech companies as 'obligatory passing points' that gain authority to select who can navigate the app (i.e. who holds this device) and on what conditions (i.e. permissions to gather data) (Poell & Van Dijck, 2016; ibid). Similar to 'hotspots' in European border management systems, this implicates *centralizing* and *selective* bordering practices but, differently, it does not relate to processes of data collection and personalization (cf. Pollozek & Passoth, 2019). In this vein, it installs a *stable channeled* form that, unlike individualized forms in OLS, is similarly selective to all users and allows them to see the same presentations on the user interface.

Everyday use

Navigations of everyday use were assembled into a stable set of intersecting hyperlinks. First, after entering the app, a 'Welcome page' with four hypertextual buttons with names and flags was displayed (see Figure 29a). Second, clicking these buttons led to *country-specific pages* which, on their part, included hypertextual buttons with icons and names (see Figure 29b). Third, each button then led to (*country-specific) institution-*

specific pages with information on specific institutions (e.g., education, health, employment) *within* these countries (see Figure 29c). Fourth, these institution-specific pages contained videos, partitioned pieces of text, outgoing hyperlinks (i.e. embedded in 'View page' buttons), and hyperlinks to PDF documents with linguistic translations, which could be navigated by clicking and scrolling.



From left to right: Figure 29a (Welcome page), **Figure 29b** (Country-specific page), and **Figure 29c** (Country-specific / Institution-specific pages)

Since these assembled navigations are arranged by a stable set of hyperlinks, images, and texts, without possibilities for personalization, they emulate the typical features of website architectures (Helmond, 2015). More particularly, (hyper)texts act as references to countries and institutions (i.a. images of flags, country names, maps) that can be followed in different successive directions (see also November et al., 2010). Within this stable construction, the socio-technological architecture of Blend-in materializes simultaneously 'topographical *and* topological moments of bordering' (cf. Hartong & Piattoeva, 2019). That is, by drawing on country names and flags, it re-installs 'fixed' *national forms* (ibid). As references to (educational) institutions are

positioned 'in' these country-specific pages, the socio-technological architecture OLS also enacts – as a policy actor – the principle of subsidiarity that prioritizes national authority over their institutional policies (European Commission, 2017c). At the same time, because these hyperlinks enact mobilities across these national borders, the socio-technological architecture also makes up *ecological forms* – showing how institutions are operating in an adaptive set of relations (Decuypere & Simons, 2020; cf. supra). Moreover, through the position in the stable constellation of hyperlinks, Blend-in renders these national-ecological forms as 'given' similarly to all users, unlike OLS, which differentiates possibilities for flexibility and adjustment.

Suspension, closure, and leaving

The act of leaving the Blend-in app was arranged by two assemblages of navigations. The first assemblage included the 'exit', 'back' and 'delete this app' buttons on the control panel of the mobile device which, respectively, stopped operations of the app, re-directed navigations to the 'home screen', or removed the app from the device. In the absence of a personal account and as no data was gathered (see supra), there was no option to remove personal data. A second assemblage performed leaving through outgoing hyperlinks, namely, the 'View page' buttons on the 'institution-specific' pages. These hyperlinks directed navigations to the web browser, which showed websites of related (inter)national institutions, including European departments and directorates. In some instances, these hyperlinks generated messages that 'the website no longer exists'. Clicking the 'back button' in the web browser toolbar then directed navigations 'back' into the app.

The first assemblage of navigations re-articulates the app's technological architecture and its intricate interweaving with (the control panel of) a particular operating system and/or mobile device (see Light et al., 2018). Concerning the socio-technological architecture, this equally stresses the position of tech companies as 'obligatory passage points' who gain authority in structuring the navigations even up until leaving the app (Poell & Van Dijck, 2016). This demonstrates *mediating* bordering practices between Blend-in as a publicly funded app and the private tech companies in

charge of the operating system. It shows how the Blend-in app conflates an *institutional form* of education, enacted through the priority on institutional authorities, and *private* forms – enacted through the presence of commercial parties. This shows how the Blend-in app, as a (policy) actor, has to delegate part of its responsibilities to 'renew' and/or enclose itself to the private and institutional sectors (European Commission, 2016; but also Lawn, 2001).

In the second assemblage, the outgoing hyperlinks enact references to (European) education institutions. Being positioned at the 'end' of the navigation, these institutions mark the 'inside' and 'outside' of the app – they install *enclosing* bordering practices that appeal to a *European envelope* form (cf. Bratton, 2015; Nail, 2016). More specifically, this envelope 'holds' the app as a separate temporary project loosely coupled – through (in)operable links – to other ongoing and/or temporary European projects (see also Vanden Broeck, 2020). This stages Blend-in as a policy actor invoked by an emergent crisis, with limited possibilities for continuous renewal.

Discussion

This study addressed two online learning initiatives funded by the European Commission, which are positioned as policy actors in the long-term project of creating a 'borderless' European Education Area and/or as policy actors in the remediation of the so-called 'refugee crisis'. The study aimed to contribute to existing research focused on the policy enactment of European education *spaces* through, among other things, digital technologies (e.g., Lawn, 2001; Romito et al., 2019) while including how such policies and technologies implicate particular *times* (Barbousas & Seddon, 2018). In this vein, online learning initiatives are understood as policy actors invoked by 'crises' that call for flexible and renewable forms of learning on the one hand and urgent and temporary remediations on the other hand. Social topology was adopted as a theoretical and methodological lens to zoom in on bordering practices made through digital technologies in online learning initiatives, and to scrutinize how these engender entangled spaces-times. The theoretical-conceptual framework further specified a

focus on socio-technological architectures and implicated user interfaces, and argued how navigations on user interfaces concretize bordering practices of online learning initiatives. Following this argument, the methodological design of this study was centered around active navigations through two selected online learning initiatives. The findings are formulated to give focused accounts of navigations in these two respective online learning initiatives.

The first initiative, OLS, was commissioned to encourage language learning among Erasmus exchange students, yet temporarily included a limited amount of refugee students. Therefore, it was considered a policy actor that was initially related to the European project, but that was also temporarily integrated into the remediation of the refugee crisis. Navigations on user interfaces of OLS demonstrated a central role for educational institutions in organizing entry and registration, next to digital technologies like the Mobility Dashboard and related 'licenses'. These technologies differentiated learning paths for Erasmus exchange students and refugee students and thereby allowed the former to constantly co-construct their mobility while granting the latter a default and temporary pathway on the platform. This showed how the socio-technological architecture of OLS involved bordering practices that conflated and differentiated *institutional-* and *ecological* forms. Next to this, the Mobility Dashboard individually structured navigations and 'held' students' data throughout everyday use and suspensions of the platform, which generated *individualized* and *envelope* forms. These forms stipulate how OLS, as a policy actor, has set out flexible yet still enclosed spaces-times when related to the European project, while it produced a fixed and given space-time when related to the crisis remediation.

The second initiative, the Blend-in app, was focused exclusively on migrants, refugees, and support workers and was financed for a fixed term of two years. For this reason, it was considered to be explicitly linked to the remediation of the 'refugee crisis'. Characterizing the app architecture, navigations appeared to be co-organized by technologies of private tech companies, which rendered a *stable channeled* form upon entry. Nevertheless, as mainly national institutions appeared along navigations of everyday use and European institutions emerged when leaving, this showed how

Blend-in involved bordering practices that made *national forms* as well as *ecological forms*, and *European envelope forms* that continuously related to them. Ultimately, Blend-in was characterized as a stable arrangement that, as a policy actor, generated a 'common view', and thereby did not continue personalized approaches towards migration management during the refugee crisis. In addition, it operationalized the temporary nature of the 'refugee crisis' as it was not continuously renewed or updated, and therefore was thereby 'out of sync' with European projects. Altogether, this implied that the socio-technological architectures of both initiatives substantiated the European project as a policy orientation towards ongoing, flexible spaces-times, while the remediation of the refugee crisis generated a temporary, 'given' space-time.

The contribution of social topology to this study, as a theoretical and methodological lens, comes forward in the recognition of bordering practices as ongoing spatial and temporal enactments. With the focus on the entanglement of spaces and times, social topology showed interchanges between fixed forms of nations, institutions, and website architectures, and constantly moving individualized ecological forms as well as app- and platform architectures. The methodological design of active navigations implied, accordingly, *active* involvement in these bordering practices. This means that the study recognizes how, first of all, the selection (criteria) yielded a bordered research terrain, which focused on a specific area of concern. More specifically, while addressing relations between policies, technologies, and people, the focus was merely on their visible appearance on the user interface. Second, premises that informed navigation protocols distinguished different positions and stages in navigations (i.a. regular vs slowed down use; registration and entry, everyday use and suspension, closure and leaving), which implied bordering practices that engendered segmented temporalities and spaces. Finally, navigations were rendered into reconstructions, including descriptions of assembled data pieces and related interpretations. In this sense, navigations brought together 'frozen' data fragments into different sequences and reshuffled temporalities, while finally turning them into texts and visualizations that are, necessarily, 'snapshots'. In this vein, this chapter cannot do justice to ongoing movements and fluidities made through technologies in these online

learning initiatives. Through detailed elucidations on the methodology and by compiling non-linear readings of texts and visualizations, the study has still aimed to support the transparency and rigor of the study. That is, it has aimed to *show how exactly* it engaged with these bordering practices, and thus with the making of spaces-times.

Against this background, the study recognizes how the formulated findings generate multiple possibilities for EC-funded online learning initiatives to evolve. First of all, the findings point to various redistributions of *responsibilities* for education. The social topological lens specifically guided a gaze on the (inter)changing positions of institutions, (trans)national policies, and tech companies as 'obligatory passing points' within socio-technological architectures (Callon, 1986; Poell & Van Dijck, 2016). Moreover, it stipulated how this generates confusion of institutional and ecological forms, public and private forms, and national and (trans)European forms of education. These confusions imply that, in the current European online learning landscape, responsibilities are not clearly 'located' which, in turn, raises questions about who 'picks them up'. Second, the findings highlight differentiated learning trajectories and related implications for (non-)European students. The findings thereby call into question whether online learning initiatives delineate a 'common' European education space or draw more on the tendency to generate personalized spaces (EERJ Initiative Group, 2015; Romito et al., 2019). Moreover, it interrogates how European policies draw on digital technologies to establish border regimes that, ultimately, favor particular mobilities of particular (European) people (M'charek et al., 2014; van Reekum, 2019). By highlighting these questions, this study considers broader discussions beyond the specific cases that are being studied. That is, it aims to interpose the relatively short development of digitalization in (European) education, in which digital technologies have been positioned as 'flexible' solutions in times of crisis. Particularly, it questions whether these technologies are flexible per se, and who benefits from their flexibility. The study thereby stirs up discussions on how European online learning initiatives could integrate long-term visions with crisis remediations and, accordingly, could support continuously renewable educational spaces-times.

Notes

Screenshot for Figure 26 was made on the OLS website (https://erasmusplusols.eu/en/) in August 2019. Screenshots for Figure 27 and 28a and 28b were made on the OLS platform (https://app.erasmusplusols.eu/mp/mobility-dashboard), based on a personal account/license of the first author.

Screenshots for Figure 29a, 29b, and 29c were made in the app of Blend-in (see http://blend-in.eu/en/).

What does this chapter say about European Open Education?

This chapter focuses on questions about the involvement of European policy, and how it appears on the user interfaces of online education initiatives that are filed as 'MOOCs' in an online repository. While these initiatives, thereby, constitute other examples of loose affiliations with notions of 'openness', they do explicitly pursue the ambition of inclusion of audiences that would otherwise experience difficulties entering education, particularly migrants and refugees (Weller, 2014). This chapter emphasizes, nevertheless, that these initiatives perform particular differentiations and shifting responsibilities that have educational implications as well as implications for the involvement of Europe. Educationally, the case study demonstrates how the authority of institutions is being centralized rather than relinquished, and that this authority is more focused on administrative responsibilities than teaching responsibilities (cf. Chapter 5). This counters the idea that Open Education, and its reliance on digital technologies, allows non-hierarchical knowledge exchanges beyond the bounds of institutions (Araya et al., 2012). Next to this, it shows how European policies appeal to the 'flexibility' of online tools to shift responsibilities to deal with 'crises' to these platforms, apps, and websites, which are expected to enable differentiated paths among migrants and 'native' Europeans. While this chapter particularly focuses on the so-called 'refugee crisis', a similar appeal can be recognized in the wake of the 'financial crisis' (cf., the communication 'Opening Up Education by the European Commission, 2013), and the 'COVID-19 crisis' (cf., the Digital Education Action Plan by the European Commission, 2021). That is, in those moments, online tools have also been expected to 'solve' the problems of educational actors. It is, therefore, worthwhile to explore how platforms impact the tasks of educational actors, and whether and how these truly generate 'solutions' or rather change their practice.

What does this chapter say about the (developed) methods?

This chapter follows the objective to develop protocols for data collection. The 'walkthrough method' (Light et al., 2018) has been a relevant source of inspiration in this pursuit as it applies a focus 'on' user interfaces while posing more concrete questions about how a 'regular user' would interact with the user interface, and what elements generate these expectations. Thereby, it relates well to the social topological interest in how *movements* are being structured, and integrates this interest into a concrete instrument. Moreover, by interrogating 'who' and 'what' is (not) included in these movements, the walkthrough method has endowed this chapter with the ability to formulate a socio-material critique of the politics implied in this platform (Edwards & Fenwick, 2015; Postma, 2012). A main difference between this chapter and the previous ones is that it did not integrate visualizations that served as abstractions of the social topological forms. Instead, it builds on (drawings of) screenshots and descriptions, and relies more heavily on concepts to epitomize the social topological connections. In this regard, the chapter does not have the visual backbone to show how social topological forms can be 'read' from the descriptions (Decuypere & Simons, 2016). Moreover, the method is mainly 'user-centered' in the sense that it prioritizes the view 'on' the user interface (Light et al., 2018). Without accounts of how these user interfaces are made by developers of platforms, and how they are deployed by 'other' users, the wider range of different usages of these online learning initiatives have been left unnoticed (see Schraube, 2013). Based on these reflections, the next step in the development of the methodologies is to integrate protocols for data collection into an empirical study that focuses on the practices 'on', 'beyond', and 'with' the user interface in combination, and to develop visualizations that translate these interrelated practices into coherent forms.

Chapter 7: MOOCs and Learning Analytics: university cases[5]

This chapter addresses recent debates about Learning Analytics (LA) – a field of research that produces and analyzes digital data about 'learners' to understand and predict their behaviors, and to experiment with feedback and other interventions to 'optimize' those behaviors (Gašević et al., 2015). The chapter particularly attends to the popular model of the *feedback loop* that renders operations of LA into a seamless, cyclical, closed flow of data that is continuously generated through learning environments and passed on by algorithms, analytics dashboards, learners, and/or instructors (Khalil & Ebner, 2016; Pardo, 2018). Multiple presentations of feedback loops exist in the LA literature that delegate, at least, two kinds of feedback functions to analytics dashboards. First, there are models of feedback loops that center around *analytics dashboards for learners*. These dashboards present data about learners' personal performances, such as proportions of correct quiz answers, following the idea that these presentations allow learners to reflect on, and regulate, their own learning (Gašević et al., 2015; Khalil & Ebner, 2016). Second, there are models of feedback loops that center around *analytics dashboards for instructors*. These dashboards present aggregate data about (groups of) learners, such as average grades on quizzes among clusters of (in)active or lurking learners, which are framed as 'pedagogically neutral' information for instructors to make decisions about feedback (e.g., targeted messages to learners) or other interventions (e.g., adjustments in learning materials) (Eradze & Tammets, 2017; Pardo, 2018). The dashboards and models proposed by LA are deployed in various fields of education, including secondary schools and formal higher education, where they are shown to be used to inform the prevention of drop-out among students (Jarke & Macgilchrist, 2021; Williamson, 2018b). This chapter, however, specifically focuses on the application of LA dashboards and the model of the feedback loop in Massive Open Online Courses (MOOCs) – typically portrayed as online versions of university courses that are 'openly' accessible on dedicated platforms

[5] This chapter is submitted for publication to *Learning, Media and Technology*.

to unlimited amounts of learners (Ebben & Murphy, 2014; Knox, 2018). MOOC platforms have increasingly integrated analytics dashboards for instructors based on the argument that they allow seeing the performances of huge numbers of learners – 'hidden' behind their screens – and devising feedback or other interventions based on these performances (ibid.). MOOC platforms also increasingly integrate analytics dashboards for learners based on the assumption that these dashboards establish 'timely' and 'personalized' feedback for learners at a large scale, which would ameliorate the notoriously high attrition rates in MOOCs (Pérez-Sanagustin et al., 2021; Topali et al., 2020). This means that the continuous flows of data depicted through feedback loops do not only constitute the 'ends' of LA research, but also the means. That is, the intention is not just to use learners' data to find ways of keeping them 'in the loop', but also to use interventions that make learners continuously active so that they 'close the loop' of ongoing data flows (Khalil & Ebner, 2016).

The position of this chapter regarding these developments is in line with critical studies that have already pointed at the problematics of LA and their application of the model of the feedback loop. This concerns studies that have countered the supposed pedagogical neutrality of LA dashboards by showing how these inscribe preferred actions and end goals, and thereby generate ideas about what 'good' learners and instructors are (e.g., Knox, 2018). It also concerns studies that argue that LA, by pre-inscribing these ideas, establishes 'closed circuits of expert knowledge' that foreclose where and when pedagogical decisions are made (Perrotta & Williamson, 2018). Relatedly, this chapter affiliates with studies that put the spotlight on the more complex, 'messy', and open-ended practices of learners, instructors, and data analysts (in MOOCs), which contrast what is modeled in neat and circular models (Hartong & Förschler, 2019; Ross et al., 2014). Based on this, the chapter particularly problematizes the closed, singular *form* of the feedback loop, as it conveys the image of an automatic, 'objective', and uninterrupted flow of data while negating the decisions affecting and being made by people. This chapter taps into this problem by reporting on an empirical study that analyzes the complexities of teaching, learning, and 'doing data' with analytics dashboards in MOOCs, and that intends to offer alternative frames

of reference for doing research and working with LA beyond the singular loop model. More specifically, these alternative frames of reference include new scenarios and new concepts that account for the multiple lines of automated and human decision-making that come into play when using analytics dashboards and other features in MOOCs. In what follows, the chapter takes note of existing (learning) theories that have been associated with feedback, feedback loops, LA, and MOOCs. Next, the chapter sets out the methodology for the empirical study, which bases itself on social topology, digital data infrastructures, and feedback as three different (but related) sensitizing devices. After that, the specific application of the methods is described, which offers an initial contextualization of the work of design teams in two universities that develop MOOCs. The findings are developed through visualizations and textual accounts that highlight how feedback emerged through and *beyond* analytics dashboards, and through and *beyond* loops. Specifically, the findings show how feedback for learners arises out of a particular *distance* and *incoming information,* but also through continuous *self-optimization* and *care* for the relationships among instructors, design teams, MOOCs, platforms, and learners. In the discussion, we address how the illuminated relations stress the importance of *human agencies,* i.a. learners, staff, and researchers, in the realization of feedback (loops) in MOOCs. By putting the spotlight on those situations in which human agency is exerted, the chapter calls for thinking more thoroughly about responsibilities delegated to people versus 'things' in the application of LA in MOOCs.

Feedback (loops) and learning theories

Feedback has been associated with a wide array of practices and theories in education before and beyond LA. One of the theoretical links is with social constructivism, a learning theory that prioritizes knowledge-building processes among (peer) students, generally under the guidance of a teacher (e.g., Carless, 2016). Social constructivism has affiliated with the notion of 'feedback as a dialogue' to emphasize how collaborative knowledge building requires iterative cycles of (re-)interpretation (ibid). Along these lines, social constructivist literature has invoked the model of the feedback loop to stress how these cycles call for students to inquire and act on feedback, i.e., to 'close

the feedback loop' through processes of self-regulation (Carless & Winstone, 2022). Moreover, to keep these loops going, teachers are assigned with the responsibility to respond to these inquiries transparently (ibid). Some LA literature has built on this dialogic and/or social constructivist framework to set out models of feedback loops for *learner* dashboards, based on the idea that these dashboards allow learners to continuously consult, reflect, and regulate their own performance (Pardo, 2018; Pardo et al., 2019). On the other hand, this literature puts forth particular analytics dashboards for instructors that are devised for more continuous and responsive feedback, for instance, by allowing targeted 'actionable' messages to groups of learners with similar performance patterns (ibid). In MOOCs, possibilities for realizing social constructivist approaches to feedback have been mainly attributed to discussion forums – delegated pages on MOOC platforms through which learners and instructors share, inquire, and respond to each others' posts (Knox, 2014; Laurillard, 2016; Macleod et al., 2016). The reality, however, shows that these forums tend to have more linear and individual question-answer dynamics, which aligns with the often invoked 'delivery model' of MOOCs focused on the transmission, rather than construction, of knowledge (ibid).

Another learning theory that is linked to feedback is behaviorism, which bears the connotation of a linear input-output approach to 'operant conditioning', i.e., providing a stimulus in/or a controlled environment that steers behavior on a predictable path (see Thurlings et al., 2014). Behaviorism is the learning theory that is frequently recognized in the 'delivery model' of MOOCs, as it includes sequences of videos, texts, and quizzes tied together by a 'Next' button, which shapes learning into a steered 'behavior' (e.g., Knox, 2018). This steered behavior is often the product of *machine learning* which is necessarily grounded in behavioristic thinking, as it includes algorithms that learn *from* human behavior, which are subsequently applied in ways that encourage and reward particular kinds of behavioristic learning in humans (Knox et al., 2020). This is also exemplified through software and dashboards that allow 'keeping track' of learners, and their 'performance' data, and giving feedback through dashboards or other personalized messages (Eradze & Tammets, 2017; Topali et al.,

2020). These recursive exchanges between people and machines – learning from each other's 'behavior' – materialize the link between behaviorism and the model of the feedback loop, which also illustrates the complication of *human* versus *technological* agency (cf. Knox et al., 2020). Specifically, these recursive exchanges substantiate the critique that human learners are, through LA dashboards, addressed as machines that can be 'trained' to perform a predictable behavior within a good working 'system' while casting aside human teachers and their professional judgment in feedback processes (Selwyn, 2019). While considering the problematics of this 'engineering vision' (ibid.), the intention of this chapter is not to hail or denounce the application of the above theories ex ante. Rather, the chapter starts by investigating whether, where, and when these operations occur, to call into question how feedback in MOOCs – through or beyond LA – can benefit learners and teachers in their professional and intellectual aspirations.

Digital data infrastructure, feedback, and social topology: sensitizing devices

The methodology that is set out for this study follows a relational approach, which departs from a view of people and things as 'separate' stable agencies and, instead, illuminates how they are entangled in different situations (e.g., Decuypere & Simons, 2016). Through this approach, theories and concepts are not 'tested' or 'applied' but deployed as *sensitizing devices* – tools to guide the exploration of relations relevant to the research problem (Decuypere, 2021). The first sensitizing device in this methodology is the *digital data infrastructure* as defined by Lewis and Hartong (2021) which '[…] *is wherever and whomever and whatever (1) can be touched by data; and then (2) generate data themselves by the impact/use of those data; and then (3) input those data (and their own self-generating data) back into the system'* (p. 3). This definition, besides signifying digital data infrastructures, also describes how data effectuate feedback loops in relation to other technologies, people, and places. In this sense, its use as a sensitizing device guides empirical attention to relevant *situations* in which feedback could emerge through LA and its dashboards. In this way, it allows this study to recognize the local

realities and human agencies involved in making decisions about the use of LA, which supports our empirical goal (see also Perrotta & Williamson, 2016). A second sensitizing device is the term feedback itself. This means that situations that are referred to as feedback are queried to understand who and what is involved, and what exactly constitutes feedback in these situations (see also Faulkner, 2009). In the case of MOOCs, this could involve analytics dashboards but also other technologies and practices that operate beyond analytics dashboards, like discussion forums, videos, or feedback among instructors themselves. A third sensitizing device, social topology, is deployed to bring these different feedback situations together and to map whether and how these relations manifest feedback or other *forms* of practice. That is, while recognizing that social topology is a wide set of premises inspired by mathematical topology (Decuypere, 2021; Lury et al., 2012), this study builds on the social topological interest in *who* and *what* establishes relations, and *how* relations are formed. This means that social topology queries, for instance, whether relations hold together through a center or distributed joints, through a linear sequence or recursive meshes (Decuypere & Simons, 2016; Thompson & Cook, 2015). Within the interest of this study, social topology recognizes a feedback loop as a closed, singular, recursive form in which the 'beginning' and 'end' is undefinable (ibid). By querying the enactment of feedback loops empirically, social topology also illuminates people and things that constitute these relations, which may also show where, when, what, and who plays a role in starting and/or receiving the benefits of these loops. To guide the conceptualization of these 'feedback situations', the methodology also keeps on exploring and reaching out to concepts in the wider literature about digital technologies. These concepts, which will be mentioned and explained throughout the findings, are validated by the participants, which meant that they agreed with their description and that they 'fitted' their work. In this way, we worked toward the goal of this study – that is, finding new frames of reference to understand the enactment of feedback with and beyond LA – that find resonance in the field of people working and studying with LA in MOOCs.

Data collection

The empirical work focused on four MOOCs, developed by two different institutions, and disseminated on two different platforms. The researcher thereby worked together with the MOOC team at KU Leuven and the Online Course Production Service (OCPS) at the University of Edinburgh, who we refer to as 'design teams'. The work of the design teams (i.a., instructional designers, media support, and service managers) mainly consists of providing and developing informational structures (i.a., workshops, templates, meetings) for instructors and monitoring the quality of MOOCs in alignment with university- and platform policies. Instructors, in turn, are academic staff who develop and update content for MOOCs, and are responsible for providing feedback to learners. In this study, the instructors and design teams both facilitated contact with learners who – via invitations on the MOOC platform, via email, and through social media – approved to participate in this empirical inquiry.

In the data collection, the sensitizing devices were deployed through a toolbox of methods, designed to study digital data infrastructures from a social topological vantage point (Decuypere, 2021). This empirical work (see Table 3) was conducted from October 2021 to July 2022 and was purposefully planned in overlapping 'stages'. The first stage involved a method of studying how digital data infrastructures manifest *on* user interfaces, i.a., through analytics dashboards or webpages (ibid.). This method is called *navigation* and consists of the documentation of webpages through screenshots and notes, guided by a protocol (see more in van de Oudeweetering & Decuypere, 2022). The second stage consisted of document analyses and observations, intended to understand how digital data infrastructures operate *beyond* user interfaces, i.e., how they constitute and are constituted by policies of platforms, institutions, and related practices (Decuypere, 2021). In this case, this meant that documents were inquired from the design teams throughout the research process. The observations evolved a workshop series for instructors provided by the design team of KU Leuven, and took place at moments in which the involved instructors gave consent. A third stage in the data collection involved interviews with staff of the design teams, which were intended

	KU Leuven	University of Edinburgh
Navigations	2 MOOCs • 'Beer: The Science of Brewing' • 'Sustainable Business Models: Guidance for Future Farmers'	2 MOOCs • 'How to Create an Online Course' • 'Climate Solutions'
Documents	8 documents, incl. strategic plan, MOOCs4credit framework, course design template and legal documents of the platform	10 documents, incl. agenda for debrief meetings, dashboard overviews, strategic plan, and legal documents of the platform
Observations	3 workshops for instructors (instructiondesign, multimedia & platform training)	
Interviews	4 interviews with MOOC team • 2 instructional designers • 1 data coordinator/platform contact • 1 media production support	4 interviews with OCPS • 2 instructional designers • 1 course coordinator • 1 service manager/data analyst
Interviews	2 duo interviews with instructors 3 interviews with learners • 2 learners MOOC 1 • 1 learner MOOC 2	1 duo interview with instructors 5 Interviews with learners • 4 learners MOOC 1 • 1 learner MOOC 2
Hybrid workshop (3 hours)	Online presence: 1 instructional designer, 1 platform contact, 2 new staff members, 1 instructor MOOC KUL -1	On-site presence: 2 instructional designers, 1 course coordinator, 3 existing staff members

Table 3. Overview of data collection moments

to expand on the insights gained from the observations and documents and thereby situate where, when, and how these staff members were involved in the digital data infrastructure. Moreover, they were explicitly asked what feedback meant for them, in which situations feedback emerged, and who and what was involved in those situations. In preparation, they were asked to keep notes on their work-related tasks for a week in a template document, which served as a springboard for the interviews. In the fourth stage, interviews with instructors and learners were conducted to understand how they engaged *with* user interfaces, specifically trying to understand how they used dashboards and other tools in the MOOC, and how their local realities played a role herein. The interviews were semi-structured conversations, ranging from 120 to 30 minutes, and took place via teleconference due to COVID-19 measures and/or to bridge geographical distances. Approval of the Social and Societal Ethics Committee at KU Leuven was received before the start of the study. We valued a relational stance towards ethics, which meant that we safeguarded the wishes of participants through an informed consent form but also checked their agreement throughout the research process up until publication. Moreover, mid-way, a hybrid collaborative workshop was organized in return for the participants' contribution but also in light of checking and possibly amplifying the findings of the study.

Data analysis

The sensitizing devices were adopted in the data analysis by 'listing' situations in which the digital data infrastructure and feedback emerged, including the involved people and technologies (see Piattoeva & Saari, 2020). Practically, this implied multiple rounds of reading screenshots, documents, field notes, and transcripts, and singling out fragments that described situations that involved analytics dashboards, and/or referred to as feedback. The involved people and things were highlighted, and their relationships were characterized by denoting 'providers' of feedback (i.e., if giving information) and 'beneficiaries' (i.e. if receiving information). Because this part of the analysis necessitated a degree of interpretation, memos were written to document and challenge the denotation of providers and beneficiaries.

To render whether and how the mapped relations establish 'loop forms', a visualization tool for 'Arc Diagrams' was deployed (see rawgraphs.io). This tool draws on spreadsheet data and takes a 'source' (in this study: 'provider') and a 'target' (in this study: 'beneficiary'), and draws their relations in a clockwise manner while visualizing their 'weight' in terms of the thickness of the line (see Figure 30, 31, 32, & 33). In this way, the complexities of loops and linear relations are visualized. The sequence in which actors are placed on the horizontal line depends on (a) their position in the spreadsheet and (b) the overlap in relational patterns with other actors (i.e., those with dissimilar patterns are positioned more 'distant' from each other). Although the sequence could therefore not be designed beforehand, the data in the spreadsheet were purposefully ordered to enhance the clarity of the presentation. Specifically, those relations that involved learners and the user interface were registered on the 'top' of the spreadsheet – corresponding to the left side of the diagram – while relations that involved instructors and design teams were placed on the right side.

The visualizations were initially developed for the MOOCs of the two institutions separately. However, because of the significant overlap in the practices, they were integrated. In this regard, the resulting visualizations are not adopted as the 'true' representations of a single reality but as springboards to envision how relations form intersecting loops or open-ended lines, and who and what is involved in them. The following four sections display and elaborate on the visualizations. For each section, relevant relations are marked by different colors in the visualization. Accompanying texts explain how these relations came to the fore in the empirical study, and what they could mean for the educational implications of feedback in MOOCs.

Findings

Feedback through analytics for learners: distance

Deploying digital data infrastructure as a sensitizing device directed the inquiry to the operations of analytics dashboards for learners – visible on the user interface of both platforms through a 'Learner Account'. Under tabs called 'Progress', these dashboards visualized the proportion of the completed activities and/or correct answers in assessments for the individual learner. One platform had an additional dashboard, under a tab called 'Dates', that presented completed and/or upcoming deadlines. Another analytic feature on this platform, called a 'Weekly Learning Goal', comprised three buttons (one, three, or five days a week) which, after clicking, generated individual emails to learners about (the accomplishment of) this learning goal. The Privacy Policy of the platforms showed that these analytic features were enabled by Tracking Technologies, coupled with Learner Accounts, which allowed clickstream data of individual learners to be produced, assembled, and 'fed back' to these dashboards and personalized emails. Most learners said that they checked the dashboards, and some clicked a learning goal, but they did not always *act* on the received messages. On the one hand, they said it was not always possible to achieve learning goals or deadlines because of work, family, or other study requirements but also because of (limitations in) their *local* infrastructures, including their devices, access to WiFi, or affordable data plans. For instance, one learner explained *'[…] in our country, data is cheaper at night. […] and also the Internet is free in our office, so maybe during office hours, I log into the assignments'* [Interview 1 UoE Learner]. Differently, some learners used the 'Downloads' feature on the MOOC platform and/or printers to retrieve MOOC materials when they could not connect to the Internet. Moreover, most learners explicitly appreciated MOOCs for the possibility to learn in their 'own' time. These learners often scheduled time in their calendars, and one learner made agreements with a family member to motivate a timely and successful completion of the MOOC. Some learners also said to use their own notebooks to recall important information and, in this way, give feedback to themselves. One learner exemplified

this: *"I use my own notebook. Look.. it is here. […] after I analyze all the information I change it to my notebook so I can have some organized information […] to study after.* [Interview 3 KUL Learner].

The visualization (see next page) displays these inquiries into the digital data infrastructure from a social topological perspective and thereby shows how analytics dashboards constitute more 'messy' and complex relations than portrayed through the singular feedback loop model (see also Hartong & Förschler, 2019). More particularly, the visualization highlights how learners' engagement with dashboards and other (analytic) features on the MOOC platforms (see purple lines in Figure 30) are intertwined with practices that are not captured, modeled, or intended by the platform dashboards (see yellow lines in Figure 30). This includes their use of notebooks, schedules, and the involvement of their local infrastructure, including their devices and WiFi connection. Moreover, what this visualization shows is that learners' engagement with these local resources establishes multiple entangled loops – through which learners give feedback to themselves. These practices emerge within the 'distance' between the learner and their account – a relation that is also conceptualized by Goriunova (2019) as the *distance* between the 'digital self' and the person. As this marks the dissimilar pattern of relations across their account, and their 'local' practice, this shows where and when learners have and take the agency to develop their own interventions. More specifically, it shows that they regulate themselves 'in loops' while generating feedback through technologies available on the platform and in their local situation.

Feedback beyond analytics for learners: incoming information

When learners referred to feedback in MOOCs more broadly, they pointed to the 'Show Answer' button, a feature that appeared underneath the questions in knowledge checks (ungraded quizzes) and assessments (graded quizzes). For them, this button was a source of feedback because it explained why their initial answers – based on the videos

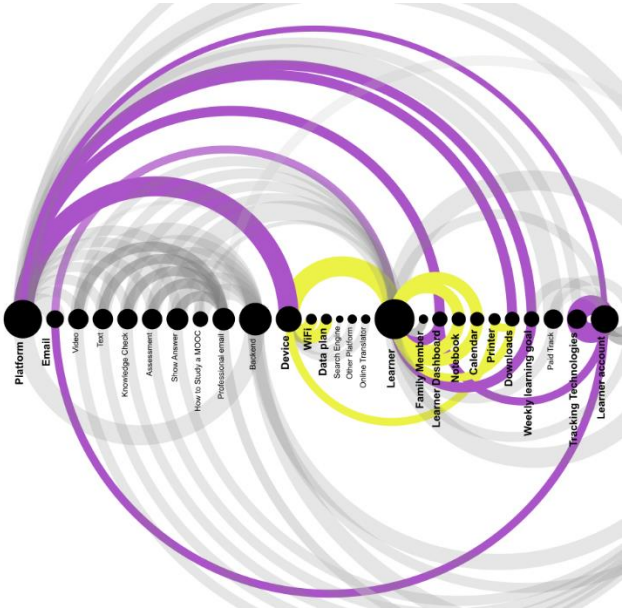


Figure 30. The purple lines present operations of analytics dashboards that entangle - from left to right - the platform, emails, learner, learner dashboard, weekly learning goal, Tracking Technologies, and Learner Account. The yellow lines indicate relations entangled with local infrastructures of learners with – from left to right – the device, WiFi, data plans, the learner, family members, notebook, calendar, printer, and downloads function. Feedback loops emerge among (1) Tracking Technologies and learner account, (2) learner account, Learner dashboard, and learner, (3) learners and calendars, and notebooks.

and texts in the MOOC – were (in)correct and, in certain instances, how they could find or formulate the correct answers the next time. The instructors and design teams, on their end, explained that all information in the MOOC, including the Show Answer button, was pre-programmed on the backend of the platform. Programming the Show Answer button was specifically purposed to give feedback at just the right moment, and scale, to avoid learners feeling 'lost' or instructors getting overwhelmed with questions. One member of the MOOC team related this to the value of transparency. '*If a participant has a question, where are they going to find the answer? If possible, try to provide the answers at the outset'*. [Interview 3 KUL Design Team]. Differently, learners and instructors also said that discussion forums of the MOOC platforms generated feedback. Most learners scrolled through the discussion forum – either to learn about

'different' perspectives on an issue or to find information that addressed questions they were left with. In general, they only posted on the forum if they felt that they could add something new, or if they could not find the information they were looking for. Some hoped for a timely response from their instructors, while others assumed instructors '*have their own work, they are not going to answer my question directly'* [Interview 1 KUL Learner]. On their end, some instructors said that they responded regularly, some took time to do research to give a more in-depth answer, while others waited for peers to respond. Learners themselves also retrieved more information *beyond* the platform, including other online platforms, search engines, and online translators, and thereby tried to generate feedback themselves. One learner said: *'when I feel like I don't understand something, […] I start asking myself questions on paper, like what is it that I don't understand about this, how can I go on and find a solution to this. And in the end, I find a way to research the answers by myself […].'* [Interview 2 KUL Learner].

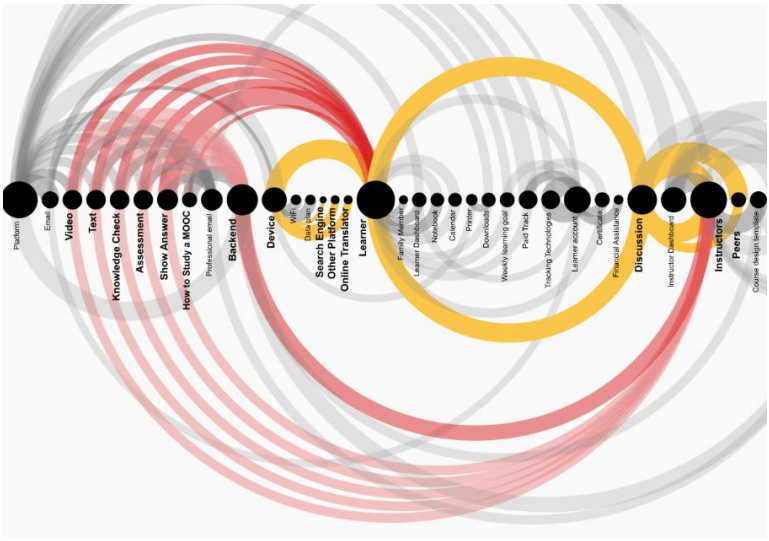


Figure 31. The red lines present information given to learners (as part of feedback). This includes - from left to right - video, text, knowledge check, assessment, Show Answer, How to Study a MOOC (i.e., an information sheet developed by one design team), the backend, the learner, and the instructors. The orange lines present the relations generated through the discussion forum. This includes – from left to right – the device, search engines, other platforms, online translators, the learner, discussion, instructors, and peers. The red lines show how incoming information is 'delivered', orange lines show how incoming information is invoked and circulated through loops.

Feedback, as a sensitizing device, thereby allowed surfacing situations in which feedback was emerging beyond analytics dashboards. First, while learners characterized the Show Answer button as feedback because of the contents of information, the visualization shows that, from a social topological perspective, these relations do not establish the recursive form of the feedback loop (see red lines in Figure 31). Rather, the visualization presents how the Show Answer button manifests linear relationships, which aligns more with the behavioristic 'delivery' model of MOOCs (Knox et al., 2020). Second, a social topological lens on the visualizations illuminates three interconnected loops, involving the discussion forums, instructors, learners, and peers (see orange lines and loops in Figure 31). These loops exemplify how discussion forums approximate the realization of a social constructivist, dialogic approach toward feedback whereby learners and instructors continuously engage in (re-)interpretations (cf. Knox, 2014). This does not only point to the conflation of different learning theories in feedback in MOOCs, but it also shows how these learning theories are connected to different spatiotemporal connotations. That is, on the one hand, there is *immediate* and *linear* feedback generated through the Show Answer button and, on the other, there is *recursive* but *suspended* feedback on the discussion forum. At the same time, both are shown to be realized through *new incoming information* which, in this regard, negates the 'closed' and continuous figure of the feedback loop. These accounts thereby balance the need for LA to safeguard 'timely' and personalized feedback (cf. Topali et al., 2021) but show how the interchange between different spatiotemporal arrangements generates situations in which learners and instructors take the agency to integrate new knowledge and keep on learning – by themselves ánd together.

Feedback through analytics dashboards for instructors: self-optimization

The sensitizing device of the digital data infrastructure also directed attention toward the analytics dashboard for instructors which, as appeared from the interviews, was accessible on the interface of one platform to the relevant instructors, design teams,

and Marketing Teams of the institutions. According to some staff in the design teams, this analytics dashboard displayed 'basic' information about whether or not they reached and retained their target audiences, including aggregate statistics about learners' demographic backgrounds, enrolment and completion rates, proportions of correct quiz answers, and numbers of views per video. Design teams could also request 'data packages' from the platform – files with pseudonymized, detailed data about learners' individual clicking behavior, for instance, when and what they contributed to discussion forums, or what answers they gave on quizzes. One design team used these data packages in a pilot project with a software application that, through an interoperable analytics dashboard, allowed targeted feedback messages to different 'groups' of learners. However, they concluded that these data packages were not always accurate and complete, and that the human resources to process these data were not always available in the institution. Hence, the analytics dashboard was received as the 'basic' source of data that was useful for understanding the achievement of their goals. As one staff member mentioned: *"[…] it is easier to pick out those kinds of stakeholder stats. The platforms focus on it, we focus on it."* [Interview 2 UoE Design Team]. Particularly, they discussed the 'stats' during team meetings (respectively called 'co-working' or 'debrief meetings') which were organized at least every time a MOOC had 'run', and thereby used the dashboards to give feedback to *instructors* and *themselves* on how they could optimize their work. For instance, they looked at the analytics dashboards to see what activities and videos were well-attended, and made adjustments in future (iterations of) MOOCs to enhance those kinds of activities. During the hybrid workshop, members of the design teams explained that these adjustments were considered to benefit learners *indirectly* because the next cohorts of learners could experience 'better' MOOCs. Moreover, the insights gained through analytics dashboards were integrated into professionalization programs for instructors in their institution who, beyond MOOCs, were expected to increasingly teach online. '*That's one of the most underacknowledged contributions of the whole MOOC procedure, right? Professionalizing teachers. Once they have made a MOOC they know how to make any online course'* [Interview 3 KUL Design Team]. Some instructors also said that they looked at

the analytics dashboards while the MOOC was 'running' to know how it was received. One instructor explained: '*Well, an ungraded quiz by itself is feedback from them [learners] to us, right? Because if they all give incorrect answers, then we either didn't explain it well or the question was too difficult.*' [Interview 2 KUL Instructors].

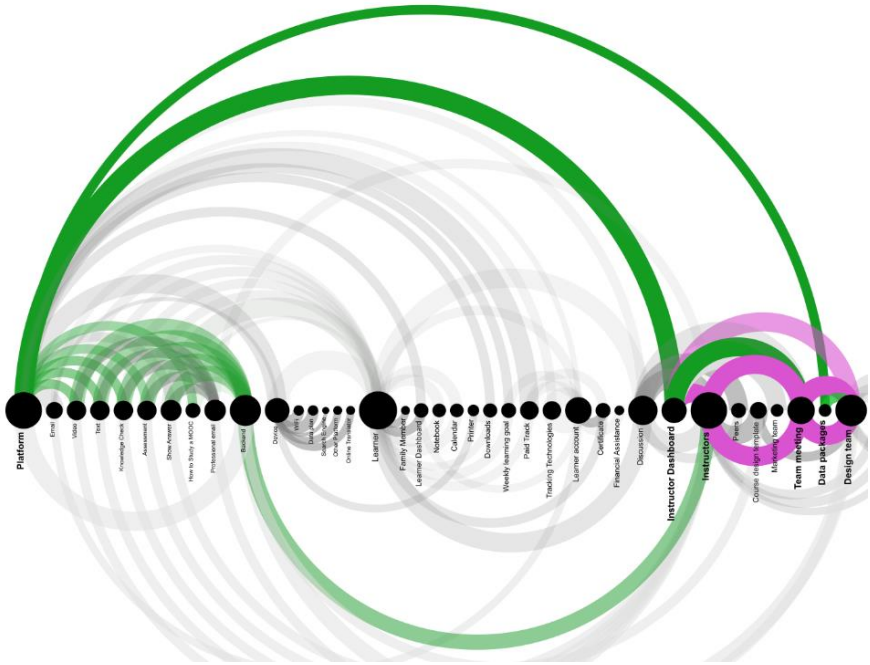


Figure 32. The darker green lines present show how – from left to right – the platform presents an instructor dashboard, which is discussed in team meetings, and how it separately generates data packages received by design teams. The bundle of light green lines indicates how instructors make changes in the learning materials, after the team meetings, and based on the analytics. The pink lines show how analytics dashboards are accessed by instructors, the Marketing Team, and the design teams, and how it generates continuous engagements around team meetings.

The visualization thereby substantiates how, from a social topological perspective, the analytics dashboard for instructors is embroiled in a complex set of relations that extend beyond a singular loop. First, the visualization shows how the analytics dashboard establishes a presence in the team meetings, while the more detailed insights from data packages are received separately by the design teams (see green lines in

Figure 32). Second, it marks how the team meetings are important situations that give rise to recursive forms of relations, i.e., feedback loops, which entangle instructors, design teams, and the platform (see pink lines in Figure 32). What appears from the interviews is that, within these feedback loops, instructors and design teams are *informed* by the 'basic' data from the analytics dashboard while they *re-inform* the platform through ongoing adjustments in learning materials (Eradze & Tammets, 2017; see the bundle of light green lines in Figure 32). In this way, these visual and textual renderings show how these feedback loops entangle instructors and design teams in processes of continuous *self-optimization* that are shaped by, as well as reshaping, MOOC platforms (Perrotta et al., 2016). It is important to note that these processes are not pre-determined, imposed, or inevitable through the application of machine learning but come about through processes of decision-making that involve technologies and people – both setting norms and conditions on 'what' can be assessed and improved.

Feedback beyond analytics for instructors and design teams: care

The sensitizing device of feedback also directed attention to other situations in which instructors and design teams execute and evaluate their work in MOOCs. First of all, the design teams explained how they initially developed informational resources for instructors, including a Service Description, a (series of) workshop(s), and a course design template. These informational resources reflected the goals of their university regarding MOOCs, stipulated in strategic plans (e.g., how many MOOCs can and should be produced per year, what is the desired amount of enrolments per MOOC). Moreover, they were based on theoretical and empirical literature about MOOCs, including an instructional design called 'ABC' (see Laurillard, 2016). They continuously updated these informational resources in line with changes at their institution, and in the field of LA and MOOCs, but also in line with experiences discussed in the team meetings. The design teams further described and referred to a part of their work as 'giving feedback' to instructors – especially on the videos, texts, or other learning materials they developed. They usually did so over email, but some

team members preferred to give this feedback in person, for instance, in a team meeting, a workshop, or in the studio where videos were shot, because this allowed for more nuance and conversation. In this vein, one staff member mentioned that giving feedback to instructors *"[…] is a matter of balancing what this person's or instructor's experience is, and what they need to be able to do [..]. Based on that, you work further."* [Interview 4 KUL Design Team]. In a similar way, the design teams appreciated that their team meetings allowed taking into account the experiences, ambitions, and needs of instructors, as well as their impressions of learners on the discussion forum. For example, one instructional designer said about the team meetings: *'[..] I also think it is about taking that information […] about enrolment to say, okay, at the end of this course you had 2500 learners. Is that what you originally wanted? […] And anything that we take from the meeting that feels like it needs to be fixed or resolved we will work with the Academic Team [instructors] to do that.'* [Interview 4 UoE Design Team].

These descriptions show how parts of the work of design team are perceived as information provision (e.g., the service description or course design template), and other parts are referred to as feedback – especially when it concerns the provision of remarks 'on' materials. Moreover, the descriptions show how this information is shaped by academic literature, and by the university's strategic plan, which exemplifies how the wider environment *beyond* the platform gains agency in the development of MOOCs (Decuypere, 2021). However, the visualizations highlight how these lines of information are also 'linear', and generally concern the transmission of insights to instructors, rather than a back-and-forth movement (see light blue lines in Figure 33 on the next page). At the same time, the visualizations re-substantiate how feedback loops, as recursive relations, emerge from the team meetings (see dark blue lines in Figure 33). In this case, these feedback loops materialize how design teams start discussions after integrating the insights of the analytics dashboards, the strategic goals of the university, and academic research, and after listening to the experiences of instructors. In this sense, these feedback loops stage the work of design teams as a matter of *care* which, as interpreted by Zakharova and Jarke (2022) constitute bodily

practices and *'arrangements that include edtech, data, and [...] other than human actors able to communicate their needs'* (p. 96). Specifically, the team meetings and other in-person discussions materialize situations in which *people's* needs are being acknowledged and listened to, while balancing the needs expressed by the analytics dashboard, research, and the university's strategic plan. These matters of care thus constitute dialogical feedback loops that, beyond the intention to 'construct knowledge' (cf. social constructivism; Carless, 2016) are concerned with bringing together, balancing, and maintaining relations among the involved people and things. These feedback loops thereby counterweigh the proposition that LA implies a behavioristic address to people as 'machines' (cf. Selwyn, 2019), as they show that LA can allow listening to machines ánd people.

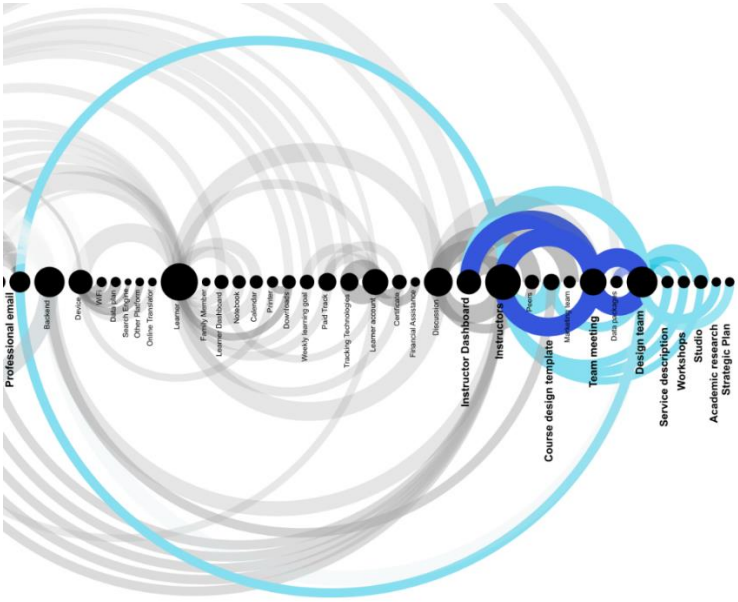


Figure 33. The light blue lines present how the design teams provide information, including – from left to right – professional email, course design template, service description, workshops, and a studio – which is for the benefit of instructors. The dark blue lines present how the design teams receive feedback with – from left to right – the instructors, the team meetings, academic research, and the strategic plan playing a role. The loops thereby shine a different light on the team meetings as generators of feedback to the design teams and instructors.

Discussion

This chapter has aimed to develop alternative frames of reference for working and doing research with LA that, different from the singular, closed model of the feedback loop that is often portrayed in LA studies, take the complexities of feedback practices in MOOCs into consideration. The chapter has thereby built on an empirical study that was conducted in collaboration with design teams, instructors, and learners in MOOCs of two universities, and that focused on their enactment of feedback with and beyond the use of analytics dashboards. The empirical study was operationalized through a newly composed methodology, which integrated three sensitizing devices. First, the definition of digital data infrastructure by Lewis and Hartong (2021) sensitized empirical attention to situations in which analytics dashboards and their related data flows played a role in the performance of feedback. Second, a sensitivity for references to 'feedback' allowed illuminating situations in which feedback was operationalized beyond the use of analytics dashboards. Third, social topology as a sensitizing device guided visualizations and interpretations of these situations as *forms* of relations, including multiple loops and linear relations. The resulting visualizations were central in reporting the findings, and did not only manifest *how* feedback is performed in MOOCs, but they also made visible *who* and *what* is involved in the realization thereof. In this way, these visualizations were able to situate where, when, and how feedback was enacted across people and technologies. At the same time, it is important to bear in mind that the findings, including the visualizations, are based on specific empirical settings. That is, the study included professionals with an established practice of developing MOOCs and learners with a strong motivation to complete MOOCs. Moreover, the visualizations are developed by selecting fragments of data that are generated through particular protocols, and by bringing them together through a digital tool with its own ordering mechanisms. This means that the findings do not 'represent' all practices in MOOCs, design teams, instructors, and learners but, rather, introduce new understandings of how MOOCs *can* establish feedback, and how people can play a role herein.

While considering this, this chapter positions its contribution to debates about LA in the empirical description of particular pedagogical practices emerging from, and beyond, the use of analytics dashboards in MOOCs. It thereby expands on studies that challenge the 'pedagogical neutrality' of analytics dashboards and that argue that LA, through dashboards, play an important role in shaping pedagogies in MOOCs (Knox, 2018; Perrotta & Williamson, 2018). Furthermore, the chapter substantiates a critique of the closed, singular model of the feedback loop posited by LA studies, exactly because it renders feedback through more open-ended and complex relations among people, technologies, and sources of information (cf. Khalil & Ebner 2016). More broadly, the chapter challenges LA and its orientation towards 'predicting' learner behavior as it exemplifies practices that can be appreciated for their local emergence and, hence, for the very fact that they are *not* predetermined (cf. Gašević et al., 2015). For instance, the findings demonstrated how MOOC learners integrated their own scheduling and note-taking practices, which were sometimes informed by, but not necessarily conforming with, the deadlines and recommendations displayed on their dashboards. Moreover, the findings showed how these learners use other features on MOOC platforms for purposes of feedback (i.a., automatic 'Shown Answer' buttons and discussion forums) as well as 'external' sources of information. By coupling these practices to the concept of 'distance' (Goriunova, 2019) between the learner and their learner account, and by emphasizing that these forms of feedback are not necessarily 'timely' and 'personalized' (cf., Topali et al. 2020), the chapter introduced notions to situate 'where' and 'when' learners exert agency to generate feedback in MOOCs. Next to this, the findings portrayed how design teams and instructors draw on analytics dashboards to inform and re-inform the development of materials for MOOCs, while listening and responding similarly to their own experiences, the needs stipulated by their university, and insights from academic literature. These practices are linked to conceptualizations of self-optimization (Perrotta et al., 2016) and matters of care (Zakharova & Jarke, 2022) that consider how practitioners make decisions regarding

feedback while negotiating the conditions, possibilities, and restrictions of the platform and its technologies.

These empirical descriptions and related concepts thereby acknowledge, yet equally extend, existing theorizations of feedback and bring nuance in the strong divisions between learning theories that either prioritize the 'self-regulation' of human learners (cf. social constructivism), or the regulation of their behavior through external stimuli (cf. behaviorism). That is, the findings stressed how analytics dashboards in MOOCs elicit particular behaviors by manifesting norms (e.g., reaching deadlines, reaching enrolment numbers) and conditions (e.g., what can we learn, who can we see). Nevertheless, they stress how (practices with) MOOCs come about through decisions made by *people,* including the way they embed technologies in their local and/or institutional settings. In this vein, the descriptions and concepts operate as frames of reference that urge future research and practice to address and appreciate the local realities of people involved in MOOCs. More particularly, these frames of reference encourage research to attend to the social and material resources that are established *on* platforms, but also those resources that are connected *with* platforms, and *beyond* platforms (Decuypere, 2021). In this sense, this chapter argues that studying feedback loops requires a consideration of the technologies available to people – design teams, instructors, and students – to generate feedback, and how these means enable, delimit, and shape their agency to generate feedback that is beneficial for themselves and for others.

What does this chapter say about European Open Education?

This chapter emphasizes questions about the educational implications of MOOCs, specifically, how they engender new roles and practices for students (cf. learners), teachers (cf. instructors), and institutional actors (e.g., policy, designers). The chapter substantiates how, as already stressed in 'fast policy' studies, platforms play a major role in shaping the relations among these actors in very immediate ways (Peck & Theodore 2015; also Lewis & Hogan 2019). Important for this dissertation is that this chapter shows how these tendencies also reshape the materialization of learning theories, which do not sediment into one singular 'strand' (cf. Siemens, 2014). While this chapter does not explicitly draw on boundaries or bordering practices, it does relate to forms of 'openness' as it shows the open-endedness of the previously assumed 'closed' feedback loops. In this sense, it repeats how 'openness' is not necessarily about making education more inclusive but about invigorating new educational relations (see also Daniel, 2012). Despite the fears that teaching in MOOCs is fully taken over and shaped by algorithms, the chapter also emphasizes how students, teachers, and designers continue to exert their agency to meet their educational aspirations and points to situations in which this becomes possible. Although this chapter does not focus on initiatives that are explicitly supported by European policies, the studied MOOCs are developed in universities in (former) EU Member States. Thereby, the chapter taps into the realization of the OpenEdu Framework and the Digital Education Action Plan(s), concerned with the integration of OE as well as Learning Analytics into HE institutions (European Commission, 2017b, 2018, 2020b). The chapter articulates how priorities from these policies (i.a. the need for teacher professionalization, automated feedback, and 'user feedback' to improve content) are actualized across institutions. In this sense, the chapter manifests how policy and practice regarding Open Education in Europe are moving in parallel directions.

What does this chapter say about the (developed) methods?

This chapter less strongly puts the spotlight on social topology and placed it as a tool *next to* the concept of digital data infrastructure and feedback to surface the emergence of a particular form of practice, in this case, the feedback loop. Feedback loops are increasingly recognized as new forms in which data circulate between sites of production and use (Lewis, 2016). In this way, the chapter makes the translation between social topology as a theory and what Marres (2012) called "*a device […], a way of structuring phenomena in practice, which is enabled (and disabled) by particular technologies* (p. 289). This translation illuminates how the methods – interviews, observations, navigations, and resulting descriptions and visualizations – intervene in practice as it induces a shift from 'recognizing' social topologies to 'making' them. The use of a visualization tool highlights this further, as the results are clearly manufactured diagrams based on an automatically-enhanced process that more readily shows 'the lines of production' than a manual drawing (cf. November et al., 2010). With further regard to the methods, this chapter actualizes the pursuit to bring together practices 'on', 'beyond', and 'with' the user interface and, thereby, to examine the operations of platforms from all (topological) 'sides' that are envisioned at the outset (cf., Decuypere, 2021). Moreover, the chapter integrates a set of protocols for navigations, observations, and interviews that are focused on making these social topological connections visible while keeping a strong focus on particular conceptual operationalizations, namely, digital data infrastructures and feedback. This chapter thus integrates various methodological ideas developed throughout this dissertation which feeds a thorough discussion, in the final chapter, about the strengths, possibilities, and limitations of the particular deployment of social topology in this research about Open Education in Europe.

Chapter 8: Discussion

This dissertation's commitment to studying European Open Education has invigorated a journey through a complex and evolving landscape of practices. The preceding chapters presented various parts and traces of this journey, beginning with the pertinent discussions, followed by theoretical premises, methodological guides, empirical encounters, and unfolding answers. It is the purpose of this final chapter, the discussion, to reflect on the journey that comprised this dissertation and to relate these to broader movements in policy, practice, and research about and beyond Open Education in Europe. The emphasis of this discussion will be on the notable *changes* in the field of Open Education in Europe over the past five and a half years that the work on this dissertation has been carried out. The rationale is that these changes are important to mark parallels, intertwinements, and divergences between the work on this dissertation and wider developments. More specifically, highlighting these changes renders this dissertation – written, bundled, and printed – into just another 'point' in the research journey that it is situated 'in the middle' of ongoing developments, and with various possibilities for new beginnings.

Starting points and movements

This dissertation has been inspired by the emergence of online forms of Open Education and, in specific, initiatives that are called for and supported by European policy. There has been the recognition that these new online forms of Open Education stood in a longer history of initiatives that attempted to broaden the reach of education beyond the institution – previously by mail, radio, and television (e.g., Peter & Deimann, 2013). In Europe in specific, these initiatives have also been framed as means to strengthen a 'European identity' (see Tait, 1996). The more recent policy documents of the European Commission also explicated the pressure to 'keep up' with the evolution of North American and Asian MOOCs and OER (European Commission, 2012; 2013; 2017). Moreover, because the European 'debt crisis' had urged significant budget cuts in public services, MOOCs and OER were received as cost-effective means

to lower investments in expansive textbooks by relying on the present teacher labor force that developed these replicable and shareable teaching materials (Goglio, 2022; Weller, 2014). In the background, there were also discussions about how European initiatives could safeguard the public character of European higher education – in contrast to American, and mainly private, commercialized platforms (Van Dijck & Poell, 2015; Goglio, 2022). In this sense, there have been high expectations about European Open Education initiatives as they were simultaneously presumed to compete with, but also do something different from, MOOC platforms that attract multiple millions of 'learners' from around the world (see also Atenas & Havemann, 2014; Shah, 2021).

The first notable changes in the field of European Open education were already noted a couple of months 'into' the research, as new policy developments showed a shift in the focus on *open* resources to a more general interest in the use of *online* platforms (i.a, European Commission, 2018, see also 2020b). This shift also surfaced when scoping out initiatives to study for this dissertation, as several initiatives were loosely coupled to MOOCs but, at the same time, focused more on engaging migrants, refugees, and young people at the 'borders' of Europe and/or extending the practices of universities. While it means that a large part of the studied initiatives is not explicitly following a definition of 'openness', it does not mean that this dissertation lost its relevance to its initial research aims. First of all, while the changes in the discourse about openness make it difficult to distinguish what initiative can be denoted as 'open' or just 'online', the interest in this dissertation has been about how openness is realized *in practice*. In this vein, the reflections throughout this dissertation and in this discussion in specific deliberately interrogate how openness can be recognized across online educational settings – with or without the denominator 'open'. Second, as this dissertation is especially interested in the changes in practice, it does not cling to an idea about what openness, education, and European policy 'is' in a field that is initially defined as 'Open Education in Europe'. Instead, by drawing on the empirical case studies, it intends to show how these ideas *have been* established in

this field, and how these practices could evolve in the future. Accordingly, this discussion section engages with the questions as they were formulated at the outset of this dissertation but more particularly zeroes in on the changes that are brought to the surface. In this vein, the questions that this discussion responds to are:

- How is 'openness' enacted in a landscape of educational practice and policy that is increasingly gravitating toward 'online' and 'digital' modes of education?
- How do online education initiatives in Europe (show possibilities to) reshape relations among educational actors?
- How has European policy been involved with forms of online education, and what kind of European Education space is enacted through this involvement?

The following three sections address answers to these questions based on the results emerging from the empirical case studies. These sections devote attention to the role of the socio-material orientation and the social topological premises in shaping these answers. Moreover, by acknowledging 'where' the findings emerged (i.e., on, beyond, and/or with the user interface) and how they are brought to display (i.e., through descriptions, visualizations, and/or typical features), initial reflections on the implications of the developed methods are included. The fourth section elaborates and concentrates on the reflections on the methods, and relates this to the broader methodological contribution of this dissertation. This is a preamble to the final and concluding section of this dissertation, which reflects on the relevance of this dissertation for educational practitioners and educational researchers.

From 'openness' to online and digital: platformization

One of the main assumptions that gave impetus to this dissertation is that openness is (1) a realization of different forms of practice (2) that includes and intertwines with closures (3) that manifests particular values (4) and that can be studied empirically

(Edwards, 2015; see also Collier & Ross, 2017; Funes & Mackness, 2018). Moreover, the dissertation followed the consideration that

> *"the task for educational researchers becomes one of engaging in a struggle over the specific approaches to open–closed-ness rather than pursuing openness per se as a worthwhile educational goal. The question is not whether to make education more open, but what forms of openness and closed-ness are justifiable"* (Edwards, 2015, p. 255).

The pursuit of this task surfaces from the empirical case studies which, with their focus on boundaries and bordering practices, generate accounts of multiple forms of openness that are enacted in tandem with forms of closedness. The dissertation has thereby moved away from the idea that Open Education initiatives perform their 'openness' merely by *eliminating* boundaries typically associated with education, such as entry requirements, financial barriers, 'inflexible' time schedules, and geographical distances to the campus. This discussion section sets out a more explicit stance regarding the values that emerge from these forms and, based on this, what forms of openness can be considered justifiable. In this sense, this discussion elucidates how I, as a researcher, position myself politically with regard to Open Education and how this position has (been) shaped (by) what has been brought to light in this dissertation (see also Edwards & Fenwick, 2015).

Before explicating this stance, it is important to acknowledge the role of the selected conceptual repertoire in developing arguments about openness. That is, the first inspiration to scrutinize openness has been the notion of the 'boundary object' which has introduced the idea that boundaries do not merely close off, but they also establish mediations between particular forms of practice (Star, 2010). Openness, in this regard, can be recognized in a bundle of relations that allows particular people and things to interact while also holding their practice intact in specific forms. The notion of bordering practices expanded on this conception by highlighting practices 'within', 'across', 'around', and/or differently positioned with regards to openness, but

generally characterized as those relations that 'put a check' on movements (e.g., Parker & Vaughan-Williams, 2012). Based on this notion of bordering practices, forms of openness are characterized based on the specific directions in which movements are being orchestrated (see also Sheller, 2018). In the case studies, boundaries and bordering practices were scrutinized through the socio-technological infrastructures and architectures of online education initiatives – concepts that refer to the relations between technologies, developers, users, and policymakers (Bratton, 2015; Star, 2010; Williamson, 2018b). These infrastructures and architectures are operationalized by querying visible technologies 'on' the user interface, how these were developed 'beyond' the user interface, and how students and teachers dealt 'with' the user interface. Together, these relations evinced *particular* boundaries and bordering practices and, hence, *particular* forms of openness.

From this perspective, the empirical case studies expressed various forms of openness that were realized through boundaries and bordering practices that are relatively stable and/or impenetrable. For instance, the MOOC platform EMMA and the MOOCs of other universities (Chapter 3 and 7) repeatedly integrate deadlines, fixed comments 'boxes', and linear navigational paths. These particular configurations make courses less 'flexible' but also allow an 'accessible' structure and encourage learners to come together at specific pages, and at specific moments. Besides this, the Virtual Exchange format of SPF (Chapter 4 and 5) adopts restrictions on registration in order to form closed dialogue groups and, at the same time, asks students to close off their physical space (i.a. closing the door or using headphones) during online conversations. These delimitations are, in this regard, purposed to encourage diverse group formations while protecting the confidentiality of their online conversations. Differently, the OLS platform (Chapter 6) restricted entry through a license that had to be given by an institution, and that only granted specific activities based on 'who' was coupled to the license, and from 'where' and 'when' they were. Another different constellation is manifested through the Blend-in app (also Chapter 6) which is compatible with only one operating system and, thus, can only be 'opened' on a particular device. However, because the app does not draw on data to make the

navigational paths adjustable, the use of the app was similarly structured for every learner who opened the app. What is shared across these configurations of relations and, from a social topological perspective can be considered 'typical' to their spatiotemporal arrangements, is that they allow students to 'assemble nearness' (cf., Ross et al., 2013). That is, the stability of these 'boundaries' *on* the user interface allows learners to develop, express, and gradually grow affinity with other students ánd technologies. Moreover, the human work *beyond* these user interfaces generates activities through which learners are continuously invited back 'in' the online space while making them also adaptable based on the local circumstances of how students can engage *with* the user interfaces (ibid.). This shows how boundaries and bordering practices that are enacted through these initiatives are not fixed once and for always, and that they do not pursue an exclusionary nature as an 'end' (cf. Collier & Ross, 2017). Rather, they accept a selection of exclusions to protect values such as diversity, confidentiality, guidance, and continuity (Funes & Mackness, 2018). The justification of these closures thus requires an evaluation of the forms of openness that they enable, and whether there are multiple forms that 'open up' for different audiences (ibid). In other words, a justified form of closedness is attentive to the exclusions it installs, and positions itself in relation to alternative forms that are open to *different* people (see also Law, 2004).

While thus starting from the idea that openness is about the orchestration of specific boundaries, the empirical case studies also substantiate the argument that online education initiatives enact 'openness' by permeating, blurring, and crossing boundaries (Collier & Ross, 2017; Oliver, 2015). Such boundaries emerged, for instance, in the first case study on EMMA when learners appeared to 'slip through' the European focus of the platform and showed non-European examples in the discussion forums 'on' the user interface (see Chapter 3). Next to this, students engaging 'with' the user interface of the Eramsus+ Virtual Exchange format explained how they generated connections across topographical borders, which changed their ideas about 'where' borders are and what is 'global', 'national', or 'local' (see Chapter 4 and 5).

The bordering practices that made up the navigations 'on' the user interface of the OLS platform and the Blend-in app were combined with openings for refugee students through, respectively, licenses 'beyond' the user interface and multiple navigations across European countries 'on' the user interface (Chapter 6). The case study on Learning Analytics in MOOCs (Chapter 7) further showed how data streams that run through platforms do not keep within the boundaries of 'closed' feedback loops but are effectuated through more open-ended processes. The social topological premises encouraged the focus on the specific ways in which these relations are shaped and how they are orchestrated, which allowed seeing how boundaries are not only stable delineations. Rather, they are ongoing practices that engender and even embody movements – albeit in particular directions (Mol & Law, 2005).

While these findings are generally appreciative of the various constellations of openness that emerge throughout the case studies, there is also a critical note to them. That is, based on what is seen across the different online education initiatives, a general trend emerges that is in line with the apparent 'platformization' of online education, and the Internet in general (Decuypere et al., 2021; Plantin et al., 2018). Platformization is thereby characterized as the tendency toward particular *socio-technological architectures* that encourage the datafication of heterogeneous practices and couple these to a proprietary API that *re-centralizes* data analyses, and uses these analyses for commercial purposes (ibid; Helmond, 2015; Van Dijck & Poell, 2015). These processes stand in contrast to the promise of platforms that, also as a figure of speech, is linked to offering a horizontal, unhampered stage for democratic exchange (Gillespie, 2017). Platforms thus constitute centers of power that, through their use of 'invisible' software, algorithms, and 'visible' personal accounts, 'paywalls', and targeted notifications generate new forms of revenue (Ananny & Crawford, 2018; Perrotta et al., 2021). It is this tendency that stands in contrast with the initial ideals of the Open Education movement, which had appraised the Internet's ability to relinquish knowledge exchanges from hegemonic structures – allowing people to 'freely' connect to peers (Alevizou, 2015; Araya et al., 2012). Social topology has enabled this dissertation to recognize these operations by focusing on the specific *forms*

in which platforms orchestrate relations, in this case, through boundaries and bordering practices that organize relations through a center rather than through distributed peer-to-peer networks (see also Thompson & Cook, 2015). At the same time, by zeroing in on the specificities of these relations, social topology allowed mapping *who* and *what* is involved in these centralized (plat)forms and, hence, how these initiatives assembled specific publics (Gillespie, 2017; Lewis, 2020b; Marres, 2012b). These publics generally consist of *individuals* who are able to arrange the necessary material resources to connect online, follow a study rhythm, and orient *themselves* across the different materials presented in a MOOC (see particularly Chapter 6 and 7). However, the use of social topology also allowed surfacing *differences* across the online education initiatives that are studied, which showed that there is more going on beyond these platform logics. More specifically, the online education initiatives also organized practices in forms that allow for individuality ánd group formation, similarities ánd differences, and central attention next to dispersed connections to unfold (see particularly Chapter 4 and 5). The justification of these different forms of openness can, in this sense, be based on the specific 'types' of students and teachers that are included, but that are also *brought into being* through these initiatives (cf., Edwards, 2015). In other words, it requires tapping into the educational implications of, and the involvement of European policies in, these online initiatives – questions that will be addressed in the next sections.

Online education: changing relations and replacing responsibilities

The second question that guides this dissertation responds to concerns about the implications of Open Education initiatives in Europe for educational practice. More specifically, it interrogates how roles and relations among students, teachers, and institutions change when they are involved in these initiatives. The dissertation thereby departs from overly optimistic as well as merely critical expectations that MOOCs and OER will radically 'disrupt' the education field (see for instance Yuan & Powell, 2013). Rather, it intends to dive into the complexities of Open Education initiatives to

scrutinize whether and how these show continuities with 'typical' education practices and/or how they manifest changes that mark the uniqueness of these educational formats (Bayne et al., 2015; Decuypere, 2018). In this regard, the purpose has been to map out patterns and variations across multiple initiatives while evaluations about the desirability of emerging continuities and changes are postponed (Ross & Collier, 2016; Selwyn et al., 2020). This discussion, positioned at the 'end' of this dissertation, thus marks a moment to situate the case studies in the ongoing 'mainstreaming' of digital technologies – including MOOCs and OER – in education, and to reflect on their possible consequences for educational practice (Selwyn, 2019; Selwyn et al., 2020).

From what appeared 'on' the user interfaces, the studied Open Education initiatives continue several features that are increasingly associated with a 'standard MOOC pedagogy' (Laurillard, 2016; see also Lewis, 2020b). First of all, the initiatives manifest courses through *sequences* of webpages – generally, with weekly video lectures, reading materials, and time-stamped deadlines glued together by a 'next' button (see Chapter 3, 4, 6, and 7). In this way, these sequences emulate the typical linear time-space configuration of a school curriculum, which is based on the idea that every student 'follows' the same path to 'accumulate' knowledge (Nespor, 1994). This is already an indication that the studied online education initiatives – similar to general patterns across MOOCs and OER – do not challenge the 'traditional' transmission-based mode of teaching in higher education (Weller, 2014; cf.; Perifanou & Economides, 2022; King & Lee, 2023). Another recurrent pattern on the user interfaces of these Open Education initiatives is that they generally integrate 'learner dashboards' that visualize performance metrics such as the proportion of (un)completed tasks and assignments, which shows how these dashboards fit into the linear timeline of the courses (Knox, 2018; Van Dijck & Poell, 2015). In addition, it fits into the wider observation that dashboards across and beyond MOOCs prioritize *individual* performances, and render them through decontextualized data (Lewis, 2020b; Williamson, 2016). In this sense, the studied initiatives substantiate the tendency to address MOOC learners as self-directed individuals that are responsible

for their own learning outcomes, while de-emphasizing contact with teachers and peers, and the relevance of what is *exactly* being studied (Bayne et al., 2015; Knox, 2016a). The socio-material orientation thereby allowed the empirical studies to show how these responsible, self-directed learners are 'naturally' more attracted to these online education initiatives. That is, it shifted attention to the socio-material conditions in and of the initiatives that bring this 'figure' of the learner into being, simply by (dis)allowing particular interactions (Decuypere, 2018b; Knox, 2016b). These ways of individualizing and responsibilizing 'learners' is gaining traction across different educational settings, not the least *through* MOOCs. What is also shown in the case study about Learning Analytics (Chapter 7), MOOCs are increasingly being used to experiment with digital tools to gain knowledge about 'optimal' behaviors, and how these are tweaked. This knowledge, condensed in the field of Learning Analytics, is increasingly deployed in software, platforms, and other online tools for schools and universities to 'structure' tasks, to 'predict' and 'intervene' in learning outcomes, and thereby to make learning more 'efficient' (Alirezabeigi et al., 2022; Jarke & Macgilchrist, 2021; Macgilchrist, 2019; Winters et al., 2020). What is marked in (these and other) critical studies is that, besides these intentions, the use of these digital tools also introduces and exacerbates pressures and anxieties about performance, and inequalities among students in terms of how they are addressed and are able to learn accordingly (ibid). While this dissertation speculates about such consequences from what appeared 'on' the user interface, it also shows how learners engaging 'with' the user interface generally found digital tools such as dashboards 'useful' to manage the learning trajectory. At the same time, these learners acclaimed ignoring some of the unfavorable effects (i.a., 'pushing' emails and notifications, 'pressuring' deadlines) (see especially Chapter 5 and 7). While these findings can be explained by a 'selection bias' as there was only a small pool of learners that participated in the studies, it is important to note that there are two initiatives that did *not* include dashboards and that not accidently prioritized other values. Notably, the Erasmus+ Virtual Exchange format and the Blend-in app are initiatives that are purposed to encourage relations among

people, and across/with places which are not 'performances' that are readily structured or displayed 'on screen'. Rather, these are values that required an instructional design that considers how people interact 'with' and 'beyond' user interfaces and, thereby, also require a certain degree of relinquishing 'control' regarding how people interact. In this vein, the empirical case studies in this dissertation challenge the assumption that *all* learning practices in Open Education are, can, and should be mediated and captured through platforms (cf. Venturini et al., 2018). More specifically, it shows how Open Education can generate new and valuable ways of learning by combining online and offline practices in ways that deviate from the 'standard'.

To surface the variety of practices arising from the online education initiatives, it has been important that the case studies also devote attention to practices 'with' and 'beyond' the user interface. For instance, this allowed an insight into the creative ways in which students and teachers assembled local resources (i.a., notebooks, devices, furniture) and involved other people (i.a. family and friends) in their learning trajectories initiatives (see Chapter 5 and 7). More specifically, this allowed demonstrating how pedagogies evolving from online education do not remain 'on' the platform but are often enacted through relations between the 'online' and 'offline' which, throughout the dissertation, is conceptualized as a 'bouncing movement' (see Chapter 4 and 5). Furthermore, the accounts of participants in the Virtual Exchange and in the university MOOCs stressed the importance of interacting with different people around the globe to learn about their *different* perspectives on some*thing* (Chapter 4, 5, and 7). From a social topological lens, these interactions emerged as the continuation of the *gathering* as an important educational form – a form usually associated with students coming together in a class(room) (Masschelein & Simons, 2018). However, what comes forward from these case studies is how online settings extend possibilities for gatherings to synchronous online meetings and asynchronous discussion boards, which enable connections with people and places otherwise not reached in 'on-campus' classes. As this shows how *new* connections are being made, these findings initially challenge the argument that online classes are (inferior) copies

of on-campus courses (Bayne et al., 2020). Next to this, the findings counter the idea that Open Education is necessarily tied to an 'independent study model' that requires automated and data-driven support structures (Gaševi**ć** et al., 2015). More specifically, it denotes the indispensable role of *people* – students and teachers – who bring knowledge from their local situation into these socio-technological configurations. Hence, instead of presuming that the roles of teachers can be *displaced* by technologies, the social topological lens allows showing how relations between students and teachers continue in different ánd similar forms while being topographically *replaced* (Lamb & Ross, 2021; cf. Gourlay, 2022).

A similar argument about the role of *institutions* surfaced from the empirical studies. When navigating 'on' the user interfaces, OLS and Blend-in (Chapter 6) showed to position institutions as administrative executives who should be consulted to get access to, respectively, the platform or to formal education. In the Erasmus+ Virtual Exchange format of SPF, institutions and teachers are similarly made responsible for these administrative tasks, while the teaching has been delegated to the education initiative (see Chapter 4 and 5). On the studied MOOC platforms (Chapter 3 and 7), institutions and institutional teachers are positioned as 'providers' of courses while many pedagogical decisions are pre-determined by the platform arrangements. The pattern that (re-)emerges from these observations is that, first of all, institutions retain a central role in Open Education despite the intention to provide education beyond institutional bounds (Peter & Deimann, 2013; Weller, 2014).To put it more strongly, institutions appear as main drivers ánd beneficiaries of online education, as these initiatives are ways to attract more students against lower costs – as teaching is 'outsourced' and courses are made replicable (see also Alevizou, 2015). In this sense, it illustrates how institutions exploit online education for 'reaching out' rather than 'opening up' (Sheail, 2018). Second and relatedly, it shows how online education engenders a new figure of a teacher– one that responds to the call of their institutions to conduct online education while also conforming to the structures of the platform, both calling for 'more learners'. It is thus a teacher that serves the project of self-

improvement of institutions and platforms – widening their reach and prestige through their online visibility and attraction (cf., Perrotta et al., 2016; Ross et al., 2014). In this regard, responsibilities are *replaced* not (only) topographically but mainly topologically: platforms are re-positioned as central actors in making pedagogical decisions while teachers take over the role of institutions to *take care* of the socio-technological infrastructures (Selwyn, 2019; Zakharova & Jarke, 2022). These replacing responsibilities are important in light of the growing normalization of online modalities after the COVID-19 pandemic, which has been received as an opportunity to 'prove the effectiveness' of online education in comparison to on-campus teaching (Williamson et al., 2020). To re-invoke the question about justifiable forms of Open or online education, I argue that the observations across the case studies show how justifiable forms of education require *local* actors to be in charge of the specific pedagogical decisions being made. In this regard, this dissertation puts the spotlight on the need for trust in teachers and students in terms of allowing them to exercise their pedagogical aspirations together *with* technology rather than delegating their functions fully to automated agents in the pursuit of 'effectiveness' (see also Gallagher & Breines, 2021).

European policy involvement: Borders, Politics, Values

The focus of this dissertation is specified by zeroing in on Open Education initiatives that are supported by the European Commission, and by asking the related question of how their involvement comes forward in the materialization of these initiatives. While addressing this question, the dissertation has built on an established field of research interested in how the European Commission deploys *other* kinds of initiatives (i.a., thematic networks, research projects, student mobility programs) as instruments in the pursuit of a European Education Area (e.g., Lawn, 2001; Nóvoa & Lawn, 2002; Alexiadou & Rönnberg, 2021). What emerges from this literature is that, while this space is framed as 'borderless' in the sense that it prioritizes exchanges among students, teachers, and institutions across Member States, it is also connoted with increasing deregulation, privatization, and marketization of education – meaning that the

boundaries between public and private start to blur (ibid; see also Robertson, 2011). As the work on this dissertation unfolded, an emerging line of research thereby illuminated the role of educational digital tools and platforms as such instruments, as they facilitate cross-border exchanges among students and teachers in specific ways (Decuypere & Lewis, 2021; Lewis, 2020b; Romito et al., 2019). In this regard, the initiatives that are studied for this dissertation further showed that European online education initiatives are entangled with specific policies regarding mobility and migration. That is, the case studies covered initiatives that are devised to, respectively, encourage *virtual* exchanges among young people, document the *physical* mobility of students, and deal with students 'coming in' Europe during the migration crisis. To deal with this policy entanglement, this dissertation has drawn on studies about European migration policies which analyze the general trends regarding how Europe has dealt with the border management systems and/during the so-called 'refugee crisis' (e.g., M'charek et al., 2014; Sánchez-Querubín & Rogers, 2018; Plájás et al., 2019; van Reekum, 2019). The premises of social topology have thereby been deployed to examine parallels and overlaps across the literature regarding the *forms* in which practices emerged. In this way, the intention has been to understand what is typical of the involvement of European actors in these online educational initiatives, and whether, where, when, and how these typicalities emerge.

Recognizing and denoting the European character of the studied initiatives has not been self-evident. While some initiatives explicitly state that their purpose is to showcase European (linguistic and cultural) diversity (Chapter 3), and others are explicitly related to the European Erasmus program or Action Plan (Chapter 4, 5, and 6), the intention of the case studies has been to go beyond these overt statements and to scrutinize *how exactly* Europe surfaces from them. To start 'on' the user interfaces of these initiatives, the involvement of the European Commission is made manifest through the recurrent image of the European flag at the bottom of the web pages, in videos, or on other parts of their user interface design. Next to this, the user interfaces are rendered in a selection of European languages (Chapter 3), display references to

European universities (Chapter 3, 5, 6, and 7), and showcase maps and flags of particular European countries (Chapter 6). While these images show how Europe is still represented as 'a' topography with borders in and around a designated territory, the connections that these images establish 'on' the Internet engender a wider set of *topological* relations (see also Hartong & Piattoeva, 2019). The concepts of the boundary and bordering practices allowed seeing how these topological relations are configured in specific, rather than endless, ways. For instance, the EMMA platform only integrates a selection of languages because it is dependent on a limited pool of human knowledge available to make translations (Chapter 3). Similarly, the Blend-in app only displays information about a selection of European countries based on the origin of the involved organizations and the perceived need to give this information to refugees – since they are topographically situated 'at' the border of European territory (Chapter 6). When moving beyond the user interface of several initiatives, it also became apparent that the European Commission applies regulations about which (non-)European citizens can participate in these online education endeavors, for what activities, and for how long (Chapter 4, 5, and 6). Notably, the Erasmus+ Virtual Exchange admits young people from European countries and those situated immediately around the borders of Europe, i.e. those included in the European Neighborhood Policy (European Commission, 2017a). Differently, the OLS platform allows access to students in European institutions for the period they go on Erasmus Exchange, and has allowed access to a selection of refugee students during the three-year time span that the platform was open to them (Chapter 6). This challenges the argument of the European Commission that these online initiatives allow "*All individuals to learn, Anywhere, Anytime, through Any device, with the support of Anyone*" (European Commission, 2013, p. 3). More specifically, it shows that 'who' one is, 'where' one is geographically situated, and 'when' one (wants to) participate(s) in an online education initiative – e.g., in the middle of a 'crisis' or during a mobility project – still counts for whether one is considered to be 'in' the European *online* education space. The socio-material orientation has thereby endowed this dissertation with the analytical equipment to trace 'who', 'what', 'where', and 'when' is included in these initiatives,

and what kinds of political values and interests surface from this differential inclusion (see Edwards & Fenwick, 2015).

In this light, the socio-material orientation and the premises of social topology highlight the importance of 'when' these initiatives (dis)appeared online. That is, the majority of the online education initiatives that are studied in this dissertation have been temporarily active, visible in the way they were performed as 'archived courses' (Chapter 3), included outdated hyperlinks (Chapter 3 and 6), deployed temporary 'licenses' (Chapter 6), and have, more generally, been financed for a limited period (Chapter 3, 4, 5, and 6). This temporary nature manifests the fragmented 'project time' as a form of practice that is increasingly visible across European education initiatives. More particularly, the 'project' is increasingly invoked as a timeframe that can be shared across different institutions in parallel to different *national* education schedules, semester plannings, and accreditation cycles (Decuypere & Simons, 2020; Lewis & Decuypere, 2023; Lumino & Landri, 2020). In other words, the time of the project allows institutions to 'synchronize' with each other while continuing their 'desynchronized' national time plans (see also Vanden Broeck, 2020). While visibly effective in this pursuit, there are critical comments to make about the specific and typical kind of European time that is being made. First of all, it engenders a fragmented landscape with visible 'ruins', i.e., websites that due to the abstained maintenance are left abandoned (see also Bratton, 2015). In this sense, it shows how European policies prioritize the production of new initiatives over the continuation of care for those socio-technological infrastructures that it has already set out (Zakharova & Jarke, 2022). Acknowledging the (financial) investments associated with making these initiatives, and the energy costs for holding these technologies 'online', this approach toward online education initiatives stands in contrast with the European ideals of using these modes of education to engender 'sustainable' transnational exchanges (European Commission, 2017a, 2020b; see also Adey & Bissell, 2010). Second, the short-term commitment to these online education 'projects' renders them ahistorical, in the sense that they are promoted as new, unique instances rather than standing in a longer

tradition of attempts to establish 'openness' (Peter & Deimann, 2013; Tait, 1996). This is also a way to position them as means to 'crises' – waves of migration, economic fluctuations, evolving epidemics, matters of environmental sustainability – which are similarly presented as new, unanticipated movements rather than manifestations of longer trends (see also van Reekum, 2019). However, by making their longer existence invisible, it becomes impossible to reflect on what they have done in the past, and what they could do for the future (cf. Barbousas & Seddon, 2018). By mapping initiatives as sedimentations of the Open Education movement, this dissertation intends to contribute to the (topological) historiography of European online education and make long-term reflections on the changes and fluctuation in the landscape possible (see Decuypere and Lewis, 2021). That is, while understanding the appeal of projects, I argue that it is important for European education initiatives to maintain a visibility of the past in order to *learn* from it.

Related to what can be learned, the socio-material orientation also marks the importance of mapping 'who' and 'what' is included in these initiatives, and 'where' they are situated in relation to the European Education Area, in order to understand their (topographical) politics (Edwards & Fenwick, 2015). The initiatives, as they are presented in this dissertation, thereby emulate the broader continuation of a 'liminal' Europe – a set of identities, people, places, and political states that is *not* visible in public discourses about Europe (Nic Craith, 2009). In other words, this liminal Europe is constructed as an 'absent Other' (see also Law, 2004). Across these initiatives, this has enabled the construction of a 'central' Europe that – paradoxically – is topographically scattered across different locations (see also Allen, 2009). Following the socio-material orientation, the interest in pointing this out is not to surface pre-existing intentions but to contemplate the effects of this differential display. Moreover, it taps into the previously mentioned task of the educational researcher to consider what forms of openness are also justifiable *in Europe* (see Edwards, 2015). In this regard, the findings of this dissertation ground the appeal to more attention to people 'at' and 'beyond' the supposed borders of Europe, specifically in light of the ongoing discussions about the inclusion of (new) Member States in the political/monetary

union, the continuing wars that call Europe to open up to refugees, as well as hasty pleas for walls and fences to 'protect' Europe against migration (EERJ Initiative Group, 2015; European Parliament, 2022; Moutselos, 2022). That is, in line with the values of inclusion, equality, and "unity in diversity" invoked as part of the European identity (European Commission, 2017c), this dissertation sheds light on the importance of designing online education for the purpose of learning, valuing, and dealing with differences among people around us. More specifically, it shows the possibilities for online education initiatives to encourage this kind of learning.

Methods & their inventiveness

Finally, the dissertation endeavored to explore, attune, and assemble methods that enable this and future research to examine the intricacies of educational platforms and websites. The dissertation thereby departed from existing analytic approaches and techniques that, while setting the stage for understanding the multimodal, hypertextual, adaptive, and hybrid online-offline implications of platforms, do not specifically attune to the specific questions of this dissertation (e.g., Bødker & Brügger, 2018; Howard, 2016; Lemke, 2002). In this sense, the intention has been to build on these existing methodological repertoires while pursuing methods that tap specifically into the 'open', 'educational', and 'European' character of the platforms under scrutiny. The aspiration is thereby also not to arrive at 'a' method or methodology, nor to generate ideas and practices that are only suited for the phenomenon central to this dissertation. Rather, the dissertation aspired to set out methodological proposals that could inform other studies interested in scrutinizing 'openness', education, or transnational relations in platforms in different combinations.

In that respect, there have been various possibilities to present the methodological contribution of this dissertation. One of the considerations has been to give the methodology a name (i.a., a 'synorography' or 'online border ethnography' have been serious options) or to pin down its 'innovations' (see Chapter 5). However, the further the work on this dissertation progressed, the more I reconciled with the

fact that announcing a name for a 'new' methodology would risk 'fixing' and 'essentializing' it - the very thing I intended to challenge (see also Law, 1999). Hence, instead of looking for extrinsic means, I turned to Lury and Wakeford's (2012) appeal to the 'inventiveness' of methods which, according to them:

"[…] is to be found in the relation between two moments: the addressing of a method – an anecdote, a probe, a category – to a specific problem, and the capacity of what emerges in the use of that method to change the problem. It is this combination, we suggest, that makes a method answerable to its problem, and provides the basis of its self-displacing movement, its inventiveness, although the likelihood of that inventiveness can never be known in advance of a specific use." (p.7).

In what follows, I will argue how this statement about the inventiveness of methods led me to locate the methodological contribution of this dissertation 'in' social topology, and 'in' the specific ways it has been integrated into the methods. The upcoming section thereby discusses how social topology has (in)formed the 'addressing' of the research problems. This involves the transformation of methods for engaging with the field, including active navigations, interview techniques, and observation protocols. Besides recapitulating the specificities of these methods, this section discusses the contribution that emerges from the connections between the methods and how this inspires a new kind of *topological positionality* that is particularly suited for research about online practices. The subsequent section, in turn, discusses how social topology contributed to changing the research problems in this dissertation. This involves methods for analysis and interpretation, including illuminations, descriptions, visualizations, and typicalities. The contribution of social topology, in this regard, is situated in the possibilities that these methods engender for sparking a *poetic* understanding and, thereby, for 'openings' to new practices.

Addressing methods 'on', 'beyond', and 'with' user interfaces: positionality

One of the central methodological tenets of this dissertation is the importance of scrutinizing practices 'on', 'beyond', and 'with' user interfaces. This has been a central guidance during engagement with the field, as it informed decisions about who and what is involved in the empirical study – in this dissertation, whether the study involves hypertextual arrangements, and/or platform developers, and/or policymakers, and/or students and teachers. Moreover, it established the foundation for decisions about where and how these actors are queried, that is, whether they involve navigations on screen, (online) interviews, or on-site fieldwork. These methods for engagement have been rolled out in a step-by-step manner and, throughout, social topology has informed each of the methods separately. At the same time, the use of social topology also generated new ideas about how the connections across these different methods can be understood.

To start with, social topology informed active navigations as methods to engage with practices 'on' user interfaces. Active navigations thereby consist of dynamic interactions with the hypertextual arrangements of platforms which are documented through screen (video) recordings, voice memos, and notes. Active navigations thus do not keep to a linear, superficial 'clicking' of buttons, but integrated an attentive gaze to the movements and layeredness implied in the construction of platforms and websites. It is specifically this attentiveness that allows active navigations to render the complexities of online (learning) environments as *social topological* spaces-times (see also November et al., 2010). The dissertation thereby started from the assumption that a 'first-person perspective' (in this case, the researcher looking at the user interface) allows an understanding of how a 'regular user' is addressed as, and made into, a subject (Schraube, 2013). Later in the dissertation, the 'walkthrough method' has been encountered as a resourceful tool to foreground further questions about how this subjectivity is made (Light et al., 2018). For instance, the walkthrough method centralizes questions regarding what users are 'expected' to do, what they are hampered from doing, and what are the political interests in these different 'doings'

(ibid). Integrating these questions into a 'navigation protocol' also enabled *others* (i.a., critical friends, readers) to trace how the researcher embarked on the navigational journey. In this regard, it established a tool to assess the validity of the navigations while keeping to a socio-material orientation that appreciates the phenomenon as a complex constellation of people and things and, thus, understands that a *different* researcher in a *different* setting also brings in *different* realities (Rimpiläinen, 2015). A second set of methods, including interviews with platform 'staff' and analyses of the documents they deploy, are transformed through the social topological lens to understand them as practices 'beyond' user interfaces. That is, the choice to 'move' the empirical inquiry to the dispersed locations in which the platforms are made is based on social topological literature that considers how these movements allow topological connections to surface – specifically, those that 'construct' platforms (Landri, 2013; Lewis et al., 2016; Seaver, 2017). The specific kinds of interviews, observation techniques, and document analyses are initially inspired by relational approaches that prompt details about daily routines, including work that research participants might find 'boring' and not of interest to the researcher (Ceulemans et al., 2014; Decuypere, 2019; Star, 1999). These insights are combined with studies that are conducted, and published, over the same time that the work on this dissertation has been carried out, which increasingly combined fieldwork with analyses of user interfaces to locate *where, when,* and *what* decisions are being made about the user interface design (e.g., Ritter, 2021; Tkacz et al., 2021). As the findingss surfaced, it showed that these methods allowed insights into pivotal moments, such as decisions about what data to produce and process, how practical possibilities and limitations are balanced against values, and how responsibilities of human actors are shared with automated functions of platforms. In this sense, these methods are not merely purposed to sketch a 'context' but to reconstruct the 'layeredness' of the social-technological architectures that make these online initiatives into broader social topological spaces-times (Bratton, 2015; Decuypere, 2021). Third and final in this dissertation, social topology invigorated online and on-site fieldwork as methods to gain insight into practices 'with' user interfaces. This fieldwork has especially been purposed to understand the local realities

of students and teachers – realities that are often left unnoticed in 'grand' narratives about online education, which promise that learning and teaching can happen 'anytime, anywhere' (see also Bayne et al., 2014; Sheail, 2018). For these reasons, on-site and online methods – ranging from (group) interviews with various prompts to diary approaches to take note of the weekly tasks – are devised to welcome detailed descriptions from students and teachers about how they organize their setting when studying or teaching online (ibid; see also Thompson, 2016). While the intention has initially been to get a view into their *individual* localities, the findings especially demonstrate how students establish new kinds of connections to 'the campus' ánd to other learners – showing that online education is not necessarily an isolated practice (Bayne et al., 2014). The methods thus showed the usefulness of the social topological interest in connections to understand the operations of platforms, over and beyond understanding the specificities of relations within topographical locations (Lewis, 2016).

Against this background, the contribution of social topology also surfaces from the way that the prepositions – 'on', 'beyond', and 'with' – have allowed situating the methods to scrutinize online practices without 'fixing' them to particular practices, protocols, and research sites (cf. Law, 1999). That is, by embedding these prepositions into the social topological repertoire, they operate tools or 'entry points' that allow situating the fieldwork *in relation to* the ongoing operations of platforms apps, and websites irrespective of 'where' these places are located topographically (Decuypere, 2021; Hartong, 2021). In a similar way, they guide a research audience to follow the researchers' movements and to assess what is possible to see from their standpoints without being 'there' in the same location (see also Landri, 2013). For these reasons, I argue that the contribution of the prepositions is that they give rise to a social topological understanding of *positionality*. That is, positionality is commonly known as a tool in (mainly qualitative) research to interrogate whether and how research findings are shaped by hegemonic ways of thinking, or power differences (Mukherjee, 2017; Ravitch & Mittenfelner Carl, 2021). Feminist approaches have thereby mainly framed

positionality in terms of social categories such as gender, race, age, and class, and how these shape the gaze of the researcher vis-à-vis research participants (ibid). Already more than two decades ago, Sheppard (2002) proposed that topological thinking could expand these understandings of positionality, especially in light of the increasing digitalization and globalization of social interactions. Topological thinking, he mentioned, renders explicit how positionality is established through the possibilities to establish *relations* – possibilities that, through digital technologies, are not determined by nor separate from one's topographical location and affiliations with social categories. In a similar way, these prepositions denote the kinds of relations that have shaped the research findings. That is, while each of the online education initiatives have been analyzed as practices 'on' the user interface, there have been practical and ethical restraints (i.a., no contact with the providing organizations and learners; no active or responding 'learners') that hampered movements to 'beyond' and 'with' user interfaces. At the same time, the findings show that these extended inquiries allow seeing broader connections and implications of platforms. In this sense, it is a tool that can be picked up by other researchers and readers to consider what is (not yet) seen about a particular platform. Next to this, the ability to take on these *relational positions* toward the user interface has not been separate from topographies and social categories. That is, for most case studies, the researcher has been welcomed by the staff of the platform with the explicit motivation to further the PhD trajectory and to encourage cross-fertilization of knowledge. In this regard, they made time available to speak to the researcher, and enabled contact with students within particular practical and ethical boundaries. Moreover, traveling to their offices has been possible through the financial resources and time made available through the PhD position, and the fact that the platforms were situated at a relatively reachable distance by train. This means that the researchers' affiliation with a specific (European) institution has 'opened up' many possibilities for shaping the methodology as it comes forward throughout this dissertation and, hence, for being able to develop the research in the way that it could (Faist, 2012). In this regard, denoting whether methods tapped into practices 'on', 'beyond', and 'with' user interfaces allows considering what kinds of *persons* and

materials are assembled in research about online practice. At the same time, it indicates the relative privilege of the researchers in doing so. This use of topological positionality in research about online practices thereby sets out new and important avenues for future research about educational platforms. First of all, researchers could explore and expand (combinations of) different positions regarding platforms. For instance, researchers could further methods to differentiate between practices 'beyond' and 'behind' user interfaces and, thereby, specify the role of designers versus institutions and policymakers in the development of platforms (see Decuypere, 2021; Robinson, 2022). Research could also explore whether there are differences between practices visible 'on' user interfaces or (data) practices circulating 'in' the platform architectures (see also Lewis & Decuypere, 2023). This research thus refines the different positionalities, making it more insightful for research audiences what exactly is being looked at. Second, future research can interrogate whether and how the possibilities for researchers to engage with platforms from these different positions are shaped by the (dis)advantages they encounter, including the financial means, language, and status of their institutional affiliation that open up avenues for research (Faist, 2012). In this way, the use of topological positionality could broaden the critique about the power of educational platforms to also interrogate the power differentials in *research about* platforms. In this way, it could invigorate discussions about the need for a more diverse research community involved in this area of study in order to enhance *different* perspectives on this phenomenon.

Changing Research (and) Problems: Poetics

The methods of analysis and interpretation that have been developed throughout this dissertation build on the insights generated about practices 'on', 'beyond', and 'with' user interfaces. The main purpose of these methods has been to make connections between these insights, that is, to render how the dispersed practices hold together as social topological forms. While different analytic techniques, tools, and approaches have been explored, the methodological work hinged on four consistent steps. As

acknowledged at the outset of this dissertation, these steps are influenced by and, hence, resemble the main principles of constructivist Grounded Theory – an approach that involves rounds of 'initial', 'axial', and theoretical coding to develop ideas that are 'grounded' in empirical work (cf. Clarke and Star, 2008; Charmaz, 2014). Because this line of thinking has been very central to my own education and training about qualitative analysis, it has been inexorable to how I envision the practicalities of analyzing data. However, through its emphasis on coding, it goes against the social topological interest of this dissertation in understanding and describing the relational arrangements as they emerge from empirical settings (cf., Lury & Wakeford, 2012). In this regard, social topology has been the principal source of inspiration to transform the data analysis and thereby grapple with the specific research problems central to this dissertation. In what is described in this section, this also means that social topology introduced the *changes* in the research problems that have been pivotal for generating the research findings.

The first step in the analyses in this dissertation departs from deploying sensitizing concepts to endeavor in 'initial coding', a practice generally associated with exploring words that 'fit' as a response to the research questions (see Charmaz, 2014). In this dissertation, the social topological premises invigorated the use of conceptual resources to single out movements and situations in the data that are relevant to the research problem without attaching labels (Gulson et al., 2017; Lewis, 2021). In this vein, this part of the analysis is grasped as making *illuminations.* Concretely, pieces of text are singled out from the data (i.a., interview transcriptions, screenshots, memos) using a handful of different techniques (i.a., annotations in text processing software, using a marker on printed texts, 'listing' fragments in spreadsheets). While these practices are thus not directly visible in the dissertation, they have been important for commencing the changes in the research problems as they are further developed throughout the analysis. That is, grasping these fragments as movements and situations transformed them from stories about incidents into notable manifestations of the research problem – at that moment, not yet visible 'as' a problem. More specifically, it provided means to locate where, when, with whom, and what problems may arise

and, hence, what are important actors and relations to zero into (Bowker & Star, 2002; Schraube, 2013).

Second, the dissertation also refrained from a second round of 'axial' coding which, according to constructivist Grounded Theory, is intended to tease out how the codes could be organized into (sub)categories (cf., Charmaz, 2014). The use of codes to develop categories would especially trouble this dissertation's pursuit to recognize boundaries and bordering practices as they happen 'out there', considering that categories introduce new conceptual divisions that mediate and (re-)direct practices (Freeman, 2020; Law, 2004). In other words, categories would introduce *new* boundaries and bordering practices rather than examine existing ones. Other social topological studies thereby inspired the analytic practice of developing *descriptions* that flesh out the many specificities of relational arrangements – including who, what, where, when, but especially *how* people and things configure movements and situations (Ceulemans et al., 2014; Sørensen, 2009). While developing these descriptions throughout this dissertation, it came to show how many complex relations emerge across empirical settings, and how difficult it is to make these complexities insightful through a text (see also ibid.). To engender a particular order in these descriptions, the dissertation reached out to other conceptual tools such as forms and formations, surfaces, assemblages, and feedback loops. Using these tools has been important for transforming the research problems, as they generated new orders in the previously illuminated movements and situations. While these orders thus shaped the relational arrangements that surfaced through the descriptions, explicating these tools allowed other researchers – engaged through processes of (peer) review – to evaluate the *rigor* with which these relational arrangements are made based on the specific principles (see also Ravitch & Mittenfelner Carl, 2021).

The third step of developing *visualizations* builds on, amplifies, and further transforms these descriptions. It is a step that takes the place of developing data displays, diagrams, or tables that intend to render an overview of the (relations between) findings (Charmaz, 2014). The purpose of the visualizations in this

dissertation is to display the relational arrangements that make up the empirical settings without relying on concepts, categories, or other extrinsic means (see previous arguments). In this vein, the visualizations serve as maps to trace who and what is involved in the described situations and movements and to envision how they are related – hence, how they produce social topological forms (Decuypere & Simons, 2016). The basis for the visualizations are, in this dissertation, graphic forms that operationalize the spatiotemporal properties of the concepts that are central to the research problems – boundaries, formations, surfaces, and feedback loops. For the research team, these visualizations thereby constituted means to test and challenge the interpretations addressed to the descriptions, prompting questions such as 'Is this how the relations hold together?', 'What if the relations were drawn like this, would this still fit with the descriptions?', and 'Is it correct to identify these typical properties, based on what we see in the relational arrangement?'. Based on such questions, the descriptions and visualizations were refined in tandem and, in this vein, the visualizations operated as new means for *structured reflexivity* during the process of data analysis (cf. Ravitch and Mittenfelner Carl, 2021). At the same time, the rendition of these forms has been an important step in changing the research problems as, by abstracting and detaching the relational arrangements under study from the discursive data through which they are produced, they *re-compose* the problem too (see also Lury, 2021). That is, they invoke new realities that are already 'in' the situations, and in the complexities of the infrastructures that are studied, but that engender new tangible imaginations (Jensen & Morita, 2017). Because it is not self-evident to communicate these 'imaginations' to an outside audience without further explanation, there have been legends and captions presented as guides to *read* the visualizations (Decuypere & Simons, 2016). While they are thus new discourses that are positioned alongside the visualizations, they are not intended to 'fix' new layers of meaning onto these images. That is, the intention is that they allow audiences to engage with the visualizations while also opening up possibilities for new interpretations.

The fourth and final step in the analysis involves invoking *typicalities,* a step that resembles 'theoretical' coding that is usually part of constructivist Grounded

Theory but that still bears important differences (cf. Charmaz, 2014). That is, given the social topological interest in identifying *different* forms of practice, applying theories as 'codes' risks essentializing and 'fixing' these forms to universal claims (Law, 1999; see also Lury & Wakeford, 2012). At the same time, theorizing remains important in social topological research in order to consider how forms of practices that are illuminated, described, and visualized 'in' settings can be recognized across other settings too (Decuypere & Simons, 2016). Articulating what typifies these forms, i.e., as forms of openness, education, or Europe, allows making a bridge between how these practices are recognized 'in here' and how they can also be recognized 'out there' – thus enabling the 'transferability' of the research findings (ibid; see also Law, 2004). The specificity of the social topological lens comes forward in the way that these typicalities are based on particular spatiotemporal properties, such as whether forms are momentarily solidified or continuously stretching-shrinking, whether they are dispersed or centralized, and whether and where they 'open up' or close down. Because such spatiotemporal properties can be recognized not only across empirical settings, but also across different fields of discipline, this way of theorizing also allows invoking ideas and concepts from fields of study *beyond* education. In this dissertation, it has enabled invoking and connecting ideas ranging from philosophy (e.g., the Open as the Visible; Deleuze, 1988) to infrastructure studies (Plantin et al., 2018; Star, 1999), from social geography (e.g., Elden, 2013; Martin & Secor, 2014) to Critical Border Studies (e.g., Scott, 2020), and from media studies (i.a., platforms, see Helmond, 2015) back to instructional theories (e.g., Siemens, 2014; Thurlings et al., 2013). By showing how these ideas emerge 'in' specific movements and situations, invoking typicalities is thus not only about connecting theoretical repertoires: it is about tracing and locating how different theories emerge and come together *in practice*. The final step of appealing to typicalities has thereby demonstrated possibilities to trace how a relatively new phenomenon such as Open Education in Europe arises out of broader historical and societal developments and, in this sense, is not radically 'new' (see Decuypere & Lewis, 2021). Typicalities thus transform research problems

continuously by attaching them to local, momentary, concrete movements and situations as well as to larger ideas and discourses, while yielding a new spatiotemporal language to make sense of them *as* problems.

Based on these changes introduced through social topology, I argue that the methodological contribution of these analytic methods can be situated in their ability to invigorate a *poetic* understanding of practices. That is to say, rather than pursuing an 'accurate' and 'objective' *representation* of the realities 'out there', a social topologically-informed analysis inspires a generative mode of *perceiving* and *presenting* realities (see also Sha, 2012; Law, 1999). This surfaces throughout the dissertation, and also in this discussion, in the focus on new ways of seeing (i.e., illuminating instances based on social topological 'sensitivities'), and new ways of registering (i.e., describing in relational arrangements) the empirical settings that are being engaged with (Ceulemans et al., 2014). Moreover, it comes forward in the priority of 'envisioning' these situations in new forms (see in the visualizations) and connecting these concrete empirical movements and situations to a new language (see in typicalities). The relevance of poetic understandings is thereby to expressly suspend the idea that practices should serve a 'function' and to open up new interpretations, affects, and engagements (see also Larkin, 2013). That is, it is to give a just account of the bodily experiences, perceptions, desires, and aspirations of the involved persons – from research participants to researchers to the wider public – and, in this way, to show how and why the practices that are addressed are *valuable to people* (Freeman, 2020). Because social topology considers how people play a part in making spatiotemporal arrangements, its connection to a poetic understanding opens up possibilities for challenging the visions imposed by the (ed)tech sector about what our future should be (cf. Jasanoff, 2015). One way to weave this social topological poetics into future research is to engage relevant stakeholders – students, teachers, policymakers, and other educational actors – in arts-based and speculative research, for instance, by inviting them to make objects (e.g., sketches, maquettes, postcards) that make their visions and values regarding the future tangible (see also Bayne et al., 2014; Decuypere, 2018b; Ross, 2017). On the one hand, such research activities could

also contribute to making social topology more accessible and relevant to practitioners, as they allow practitioners to explore how topologies can be *materialized* (cf., Decuypere, Hartong, & van de Oudeweetering, 2022). On the other hand, these activities could manifest as collaborations between educational practitioners and researchers that generate new questions about how to design and investigate our engagements with digital technologies (see Ross, 2017).

What has been? What now? What's next?

This dissertation has explained how it has set out responses to research problems as they *have been* emerging. It has thereby explained how methods were initially designed to answer questions about the enactment of 'openness', possible educational implications, and the involvement of European policy in Open Education. This discussion, in turn, sketches the landscape in which the empirical studies are situated *now,* March 2023. It has, in this way, elaborated upon the relations between the findings of the case studies and broader processes of platformization, replacing responsibilities among educational actors, and the borders, values, and politics of Europe. The methods, while bearing assumptions about the possible problematics of these manifestations 'out there', have attempted to expose the problems as they emerged 'in here' – that is, in the places and moments that are relevant to the initiatives that participated in the empirical research for this dissertation (Law, 2004). This demonstrates how this dissertation, rather than 'solving' the problems it started out with, appreciated a focus on 'reconstructing' these problems. This does not mean that this dissertation intends to continue troubles in the field, as this would be unethical, to say the least. Rather, as exemplified in Donna Haraway's (2016) book *Staying with the Trouble*, it means that this dissertation intends to *remain connected with* what is going on in the field rather than jumping to quick solutions. More specifically, it is based on the recognition that Open Education *itself* has been developed as a solution to 'inefficacies' and inequalities in the field of education but that, as this dissertation also demonstrates, it has come with its own new problematics. This feeds the realization that there is no

'silver bullet' that can be offered through research, which makes the option of mapping, dealing with, and weighing various problematics one of the most realistic avenues to continue the work toward 'desirable futures' (see also Ross, 2017; Macgilchrist et al., 2020).

In this way of *responding* to problems, this dissertation might generate the impression that its relevance is minor in comparison to quantitative studies that offer 'predictive models' that proclaim to inform preventive measures to issues such as drop-out, low engagement, or poor learning outcomes in online education (Zhang et al., 2021). Moreover, at the fast pace that online education has become more 'mainstream' in various education settings before, during, and through the COVID-19 pandemic, it might seem irrelevant to deliberate practices *after* they have taken place. At the same time, the contributions as they are stipulated in the previous sections show how this dissertation can, and does, contribute to research and practices even as they evolve. More specifically, it shows how this dissertation has been able to move with the ongoing changes *because* of its responsive stance, and not in spite of it. While several paths for future practice and research are sketched, I want to close this dissertation by highlighting what I recognize as the most relevant contributions of this dissertation for educational practitioners and researchers.

The conversations with research participants, including developers, teachers, students, and learners have been informative but also confronting in terms of what I thought my research could 'do' and mean for their practice. Initially, the research was often considered highly theoretical and offered little grips to improve practice. At the same time, as I kept them up-to-date with the process of my research and asked if and what they recognized in what I wrote, I equally received feedback that the findings gave new tools to recognize 'where' and 'when' problems arose and how they can be perceived differently. In other words, exposing problems in concrete situations provoked possibilities to *interfere* in practice and, thereby, to rethink possibilities about how to craft the future of these initiatives (see supra; Marres, 2017; Ross, 2017; Webb et al., 2020). For instance, the case study on EMMA (Chapter 3) highlighted the influence of the European Commission on the design of the platform through its appeal

to particular 'performance indicators'. 'Presencing' these situations engendered insights into *other* values, decisions, and quality monitoring mechanisms that were not 'in here' – showing how the platform could be shaped otherwise (Law, 2004). Differently, the studies about the Erasmus+ Virtual Exchange (Chapter 4 and 5) pointed to the indispensable role of people in support teams for keeping students engaged. For the design team, these findings inspired them to rethink whether and how these human tasks could be continued given that the growing scope of the initiative pressured them to use automated features. Next to this, the studies on the OLS platform and Blend-in app (Chapter 6) stressed the implications of personal 'accounts' and licenses, and how these may introduce inqualities through differentiation. In this sense, these findings encourage practitioners to reconsider the benefits of using such accounts, and how these balance against negative consequences. Finally, the case study about Learning Analytics in MOOCs (Chapter 7), raised awareness among design teams about the *direct* impact they had on the professionalization of teachers, as well as how this *indirectly* impacted the learners' experiences. From what came up in the collaborative workshops, this awareness opened up conversations about the time and agency that teachers need to *be* a MOOC instructor – time and agency that is, currently, largely shaped by the specificities of (commercial) MOOC platforms and institutional policies. By giving these examples, I do not argue that they 'accurately capture' or totalize the relevance of this dissertation for practitioners. The examples serve to show how the methods invoke a way of looking at practice that is not to be appropriated by researchers, and that can be reused, repurposed, and reclaimed by practitioners in ways to address situations that are problematic *to them*. It is in this way that the descriptions and theorizations in this dissertation can inspire practitioners, while also keeping to the ambition of Open Education to broaden space and time for exploration, experimentation, and participation in education (see also Weller, 2014; Wiley, 2015).

Being present in the field of online education as a researcher, and being equipped with a social topological lens, also formed my stance toward the relevance

that this dissertation has for the research community. As much as social topology is a lens that prioritizes relations over imposing hypotheses, categories, or 'grand theories', practitioners often received the papers as highly theoretical, abstract and, thereby, disconnected from practice. While I can *tell* others about the relevance of social topology, as I did throughout the previous sections, I also recognize the responsibilities of researchers in keeping this relevance – literally the relation to some*thing* and some*one* – alive. This requires a critical *distance* that, rather than affirming the authority of researchers to evaluate practitioners, simultaneously enacts a critical *proximity* to practice (Latour, 2005). That is, as topology understands distance in terms of the degree of overlap between two relational arrangements (i.a., a circle is the *same* as a square, but highly distant from a network; see also Burt, 1980), the distance between research and practice can be understood in a similar way. Research is, in this sense, distinctive as it slows down time to bring in theories, contemplate empirical observations, and exchange thoughts with different research communities. At the same time, educational researchers have an ethical obligation to follow practitioners, remain in touch, and 'test' the resonance of our thoughts. The ability to move 'in' and 'out' of professional, institutional and educational constellations is thus also a *necessity* to respond to questions about the justification of educational practice (cf. Edwards, 2015). The relevance of this dissertation for the research community, in this regard, is that it shows the importance of advancing theories that allow thinking together with different others, in different places, and at different paces.

References

Adam, T. (2019). Digital neocolonialism and massive open online courses (MOOCs): colonial pasts and neoliberal futures colonial pasts and neoliberal futures. *Learning, Media and Technology*, *44*(3), 365–380. https://doi.org/10.1080/17439884.2019.1640740

Adami, E., & Kress, G. (2014). Introduction: Multimodality, meaning making, and the issue of "text." *Text and Talk, 34*(3), 231–237. https://doi.org/10.1515/text-2014-0007

Alevizou, G. (2015). From OER to MOOCs: Critical perspectives on the historical mediation of trajectories of open education. *International Journal of Media and Cultural Politics, 11*(2), 203–224. https://doi.org/10.1386/macp.11.2.203

Alexiadou, N., & Rönnberg, L. (2021). Transcending borders in higher education: Internationalisation policies in Sweden. *European Educational Research Journal*, *21*(3), 504–519. https://doi.org/10.1177/1474904120988383

Alirezabeigi, S., Masschelein, J., & Decuypere, M. (2022). The timescape of school tasks: towards algorhythmic patterns of on-screen tasks. *Critical Studies in Education*. Advance Online Publication. https://doi.org/10.1080/17508487.2021.2009532

All Digital Weeks. (2022). *Useful tools and Resources*. All Digital Weeks. https://www.alldigitalweek.eu/useful-tools/

Allen, J. (2016). *Topologies of Power - Beyond Territory and Networks*. Routledge.

Allen, J. (2009). Three spaces of power: Territory, networks, plus a topological twist in the tale of domination and authority. *Journal of Power, 2*(2), 197–212. https://doi.org/10.1080/17540290903064267

Ananny, M., & Crawford, K. (2018). Seeing without knowing: Limitations of the transparency ideal and its application to algorithmic accountability. *New Media*

and Society, *20*(3), 973–989. https://doi.org/10.1177/1461444816676645

Araya, D., Bauwens, M., & Iacomella, F. (2012). The Philosophy of Peer Learning. *E-Learning and Digital Media*, *9*(3), 245–248. https://doi.org/10.2304/elea.2012.9.3.245

Ash, J. (2015). *The Interface Envelope.* Bloomsbury Publishing.

Ash, J., Anderson, B., Gordon, R., & Langley, P. (2018). Digital interface design and power: Friction, threshold, transition. *Environment and Planning D: Society and Space*, *36*(6), 1136–1153. https://doi.org/10.1177/0263775818767426

Atenas, J., & Havemann, L. (2014). Questions of quality in repositories of open educational resources: a literature review. *Research in Learning Technology*, *22*, 71–84. http://doi.org/10.3402/rlt.v22.20889

Baker, F. W. (2017). An Alternative Approach: Openness in Education Over the Last 100 Years. *TechTrends*, *61*, 130–140. https://doi.org/10.1007/s11528-016-0095-7

Balibar, E. (1990). The Nation Form: History and Ideology. *Review Fernand Braudel Center*, *13*(3), 329–361. https://www.jstor.org/stable/40241159

Balibar, E. (2004). *We, the People of Europe?* Princeton University Press.

Barbousas, J., & Seddon, T. (2018). Visualising the European space of education: Analytic borderland, transnational topologies and spaces of orientation. *European Educational Research Journal*, *17*(6), 766–783. https://doi.org/10.1177/1474904118797732

Barth, R. S. (1977). Beyond Open Education. *Phi Delta Kappan, 58*(6), 489–492. https://doi.org/10.1111/j.1475-682X.2001.tb01110.x

Bayne, S. (2015). What's the matter with 'technology-enhanced learning'? *Learning, Media and Technology*, *40*(1), 5–20.

https://doi.org/10.1080/17439884.2014.915851

Bayne, S., Evans, P., Ewins, R., Knox, J., Lamb, J., Macleod, H., O'Shea, C., Ross, J., Sheail, P., & Christine, S. (2020). *The Manifesto for Teaching Online*. Cambridge, MA: The MIT Press.

Bayne, S., Gallagher, M. S., & Lamb, J. (2014). Being "at" university: The social topologies of distance students. *Higher Education*, *67*(5), 569–583. https://doi.org/10.1007/s10734-013-9662-4

Bayne, S., Knox, J., & Ross, J. (2015). Open education: the need for a critical approach. *Learning, Media and Technology*, *40*(3), 247–250. https://doi.org/10.1080/17439884.2015.1065272

Beaulieu, A., & Simakova, E. (2006). Textured Connectivity: an ethnographic approach to understanding the timescape of hyperlinks. *International Journal of Scientometrics, Informetrics and Bibliometrics*, *10*(1). http://www.cindoc.csic.es/cybermetrics/articles/v10i1p5.html

Billé, F. (2018). Skinworlds: Borders, haptics, topologies. *Environment and Planning D: Society and Space*, *36*(1), 60–77. https://doi.org/10.1177/0263775817735106

Bødker, H., & Brügger, N. (2018). The shifting temporalities of online news: The Guardian's website from 1996 to 2015. *Journalism*, *19*(1), 56–74. https://doi.org/10.1177/1464884916689153

Bolldén, K. (2016). The emergence of online teaching practices: a socio-material analysis. *Learning, Media and Technology*, *41*(3), 444–462. https://doi.org/10.1080/17439884.2015.1044536

Börzel, T. A., & Risse, T. (2018). From the euro to the Schengen crises: European integration theories, politicization, and identity politics. *Journal of European Public Policy*, *25*(1), 83–108.

https://doi.org/10.1080/13501763.2017.1310281

Bott, R., & Tu, L. (1982). *Differential Forms in Algebraic Topology*. Springer.

Bowker, G. C. (2000). Biodiversity Datadiversity. *Social Studies of Science*, *30*(5), 643–683. https://doi.org/10.1177/030631200030005001

Bowker, G., & Star, S. L. (1991). Situations vs. standards in long-term, wide-scale decision-making: the case of the International Classification of Diseases. *Proceedings of the Thirty-Fourth Annual Hawaii International Conference on System Sciences*, 73–81. https://www.computer.org/csdl/proceedings/hicss/2001/12OmNzVGcJq

Bratton, B. H. (2015). *The Stack - On Software and Sovereignty*. MIT Press.

Brown, M. (2016). MOOCs as social practice: a kaleidoscope of perspectives. In E. De Corte, L. Engwell, & U. Teichler (Eds.), *From books to MOOCs: Emerging models of learning and teaching in higher education* (pp. 31–42). Portland Press.

Brügger, N. (2009). Website history and the website as an object of study. *New Media and Society*, *11*(1–2), 115–132. https://doi.org/10.1177/1461444808099574

Burridge, A., Gill, N., Kocher, A., & Martin, L. (2017). Polymorphic borders. *Territory, Politics, Governance*, *5*(3), 239–251. https://doi.org/10.1080/21622671.2017.1297253

Burt, R. S. (1980). Autonomy in a Social Topology. *American Journal of Sociology*, *85*(4), 892–925. https://doi.org/10.1086/227093

Büttner, S. M., Leopold, L., Mau, S., & Posvic, M. (2015). Professionalization in EU Policy-Making? The topology of the transnational field of EU affairs. *European Societies*, *17*(4), 569–592. https://doi.org/10.1080/14616696.2015.1072229

Bylieva, D., Bekirogullari, Z., Lobatyuk, V., & Nam, T. (2020). Analysis of the Consequences of the Transition To Online Learning on the Example of MOOC

Philosophy During the Covid-19 Pandemic. *Humanities & Social Sciences Reviews*, *8*(4), 1083–1093. https://doi.org/10.18510/hssr.2020.84103

Callon, M. (1986). Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay. *The Sociological Review, 32*(1), 196–223. https://doi.org/10.1038/sj.ejhg.5201216

Callon, Michel, Lascoumes, P., & Barthe, Y. (2009). *Acting in an Uncertain World. An Essay on Technical Democracy*. The MIT Press.

Carless, D. (2016). Encyclopedia of Educational Philosophy and Theory. In M. A. Peters (Ed.), *Encyclopedia of Educational Philosophy and Theory* (pp. 1–6). https://doi.org/10.1007/978-981-287-532-7

Carless, D., & Winstone, N. (2023). Teacher feedback literacy and its interplay with student feedback literacy. *Teaching in Higher Education*, *28*(1), 150–163. https://doi.org/10.1080/13562517.2020.1782372

Caruana, V., & Montgomery, C. (2015). Understanding the transnational higher education landscape: Shifting positionality and the complexities of partnership. *Learning and Teaching*, *8*(1), 5–29. https://doi.org/10.3167/latiss.2015.080102

Castañeda, L., & Selwyn, N. (2018). More than tools? Making sense of the ongoing digitizations of higher education. *International Journal of Educational Technology in Higher Education*, *15*(22), 1–10. https://doi.org/10.1186/s41239-018-0109-y

Ceulemans, C., Simons, M., & Struyf, E. (2014). What-if anything-do standards do in education? Topological registrations of standardising work in teacher education. *European Educational Research Journal*, *13*(1), 73–88. https://doi.org/10.2304/eerj.2014.13.1.73

Charmaz, K. (2014). *Constructing grounded theory*. Sage.

Clarke, A. E., & Star, S. L. (2008). The Social Worlds Framework: A Theory /

Methods Package. In E. J. Hackett, M. Lynch, & J. Wajcman (Eds.), *The handbook of science and technology studies* (pp. 113–137). MIT Press.

Code from Home. (2022). *Code from Home*. Codeweek. https://blog.codeweek.eu/

Colcucci, E., Devaux, A., Vrasidas, C., Safarjalani, M., & Castaño Muñoz, J. (2017). *Free Digital Learning Opportunities for Migrants and Refugees. An Analysis of Current Initiatives and Recommendations for their Further Use*. JRC Science for Policy Report. https://inee.org/sites/default/files/resources/jrc106146.pdf

Collier, A., & Ross, J. (2017). For whom, and for what? Not-yetness and thinking beyond open content. *Open Praxis*, *9*(1), 7-16. https://doi.org/10.5944/openpraxis.9.1.406

CORDIS. (2013). *European Multiple MOOC Aggregator.* CORDIS Europa. https://cordis.europa.eu/project/id/621030

Cormier, D. (2008). Rhizomatic Education: Community as Curriculum. *Innovate: Journal of Online Education*, *4*(5), Article 2. https://nsuworks.nova.edu/innovate/vol4/iss5/2/

Cormier, D., & Siemens, G. (2010). Through the Open Door: Open Courses as Research, Learning, and Engagement. *Educause Review, 45*(4), 30–39. https://er.educause.edu/articles/2010/8/through-the-open-door-open-courses-as-research-learning-and-engagement

Cothey, V., Aguillo, I., & Arroyo, N. (2006). Operationalising "Websites": lexically, semantically or topologically? *International Journal of Scientometrics, Informetrics and Bibliometrics*, *10*(1), Paper 3. https://dialnet.unirioja.es/servlet/articulo?codigo=1448759

Crea, T. M., & Sparnon, N. (2017). Democratizing education at the margins: faculty and practitioner perspectives on delivering online tertiary education for refugees. *International Journal of Educational Technology in Higher Education*,

14(43). https://doi.org/10.1186/s41239-017-0081-y

Czerniewicz, L., Deacon, A., Glover, M., & Walji, S. (2016). MOOC -making and open educational practices. *Journal of Computing in Higher Education*, *29*, 81–97. https://doi.org/10.1007/s12528-016-9128-7

Dahlberg, G. M., & Bagga-Gupta, S. (2017). Understanding glocal learning spaces. An empirical study of languaging and transmigrant positions in the virtual classroom. *Learning, Media and Technology*, *39*(4), 468–487. https://doi.org/http://dx.doi.org/10.1080/17439884.2014.931868

Daniel, J. (2012). Making Sense of MOOCs: Musings in a Maze of Myth, Paradox and Possibility. *Journal of Interactive Media in Education*, *3*, 1-20. https://doi.org/10.5334/2012-18

Decuypere, M. (2016). Diagrams of Europeanization: European education governance in the digital age. *Journal of Education Policy*, *31*(6), 851–872. https://doi.org/10.1080/02680939.2016.1212099

Decuypere, M. (2018a). *How can we design, evaluate and theoretically elaborate qualitative research methods in the digital age ? Inaugural lecture.* [PDF]. https://lirias.kuleuven.be

Decuypere, M. (2018b). Open Education platforms: Theoretical ideas, digital operations and the figure of the open learner. *European Educational Research Journal*, *18*(4), 439–460. https://doi.org/10.1177/1474904118814141

Decuypere, M. (2019a). STS in/as education: where do we stand and what is there (still) to gain? Some outlines for a future research agenda. *Discourse: Studies in the Cultural Politics of Education*, *40*(1), 136–145. https://doi.org/10.1080/01596306.2018.1549709

Decuypere, M. (2019b). Visual Network Analysis: a qualitative method for researching sociomaterial practice. *Qualitative Research*, *20*(1), 73–90.

https://doi.org/10.1177/1468794118816613

Decuypere, M. (2021). The Topologies of Data Practices: A Methodological Introduction. *Journal of New Approaches in Educational Research*, *9*(2), 67–84. https://doi.org/10.7821/naer.2021.1.650

Decuypere, M., Grimaldi, E., & Landri, P. (2021). Introduction: Critical studies of digital education platforms. *Critical Studies in Education*, *62*(1), 1–16. https://doi.org/10.1080/17508487.2020.1866050

Decuypere, M., Hartong, S., & van de Oudeweetering, K. (2022). Introduction—Space-and time-making in education: Towards a topological lens. *European Educational Research Journal*, *21*(6), 871–882. https://doi.org/10.1177/14749041221076306

Decuypere, M., & Lewis, S. (2021). Topological genealogy: a methodology to research transnational digital governance in/through/as change. *Journal of Education Policy*, 38(1), 23-45. https://doi.org/10.1080/02680939.2021.1995629

Decuypere, M., & Simons, M. (2016). Relational thinking in education: topology, sociomaterial studies, and figures. *Pedagogy, Culture and Society*, *24*(3), 371–386. https://doi.org/10.1080/14681366.2016.1166150

Decuypere, M., & Simons, M. (2020). Pasts and futures that keep the possible alive: Reflections on time, space, education and governing. *Educational Philosophy and Theory*, *52*(6), 642–654. https://doi.org/10.1080/00131857.2019.1708327

de Freitas, E. (2012). The Classroom as Rhizome: New Strategies for Diagramming Knotted Interactions. *Qualitative Inquiry, 18*(7), 557–570. https://doi.org/10.1177/1077800412450155

Deleuze, G. (1988). *Foucault* (7th ed.). University of Minnesota Press.

Downes, S. (2007). Models for Sustainable Open Educational Resources. What

Resources? *Interdisciplinary Journal of Knowledge and Learning Objects*, *3*, 29–44. https://doi.org/10.1.1.119.6019

Drucker, J. (2013). Diagrammatic Writing. *New Formations*, *78*(1), 83–101. https://doi.org/10.3898/nEWF.78.04.2013

Drucker, J. (2014). *Graphesis. Visual Forms of Knowledge Production*. Harvard University Press.

Dumitrica, D. (2017). Fixing higher education through technology: Canadian media coverage of massive open online courses. *Learning, Media and Technology, 42*(4), 454–467. https://doi.org/10.1080/17439884.2017.1278021

Dussel, I. (2013). The Assembling of Schooling: Discussing concepts and models for understanding the historical production of modern schooling. *European Educational Research Journal, 12*(2), 176–189. https://doi.org/10.2304/eerj.2013.12.2.176

Dussel, I. (2014). Is school curriculum still relevant in digital culture? Debates and challenges on contemporary cultural authority. *Archivos Analíticos de Políticas Educativas*, *22*(24), 1-26. https://doi.org/10.14507/epaa.v22n24.2014

Easterling, K. (2014). *Extrastatecraft: The power of infrastructure space*. Verso.

Ebben, M., & Murphy, J. S. (2014). Unpacking MOOC scholarly discourse : a review of nascent MOOC scholarship. *Learning, Media and Technology*, *39*(3), 328–345. https://doi.org/10.1080/17439884.2013.878352

Edwards, R. (2015). Knowledge infrastructures and the inscrutability of openness in education. *Learning, Media and Technology*, *40*(3), 251–264. https://doi.org/10.1080/17439884.2015.1006131

Edwards, R., & Fenwick, T. (2015). Critique and Politics: A sociomaterialist intervention. *Educational Philosophy and Theory*, *47*(13–14), 1385–1404. https://doi.org/10.1080/00131857.2014.930681

EERJ Initiative Group. (2015). We need to talk about Europe! Amplifying the voices of refugees. *Educational Philosophy and Theory*, *47*(13–14), 1379–1380. https://doi.org/10.1080/00131857.2015.1112612

Elden, S. (2013). Secure the volume: Vertical geopolitics and the depth of power. *Political Geography*, *34*, 35–51. https://doi.org/10.1016/j.polgeo.2012.12.009

EMMA project. (2018). *About | Emma Project*. EMMA. http://project.europeanmoocs.eu/about/

Enriquez, J. (2013). Being (t)here: mobilising 'mediaspaces' of learning. *Learning, Media and Technology*, *38*(3), 319–336. https://doi.org/10.1080/17439884.2012.685744

Eradze, M., Dipace, A., & Limone, P. (2020). Hybrid Flexible Learning with MOOCs: A Proposal to Reconceptualize the COVID-19 Emergency beyond the Crisis. *Proceedings of 2020 IEEE Learning With MOOCS, LWMOOCS 2020* (pp. 174–179). https://doi.org/10.1109/LWMOOCS50143.2020.9234358

Eradze, M., & Tammets, K. (2017). Learning Analytics in MOOCs: EMMA Case. In N. C. Lauro, E. Amaturo, M. G. Grassia, B. Aragona, & M. Marino (Eds.), *Data Science and Social Research* (pp. 193–204). Springer International Publishing.

European Commission. (2013). *Opening up Education: Innovative teaching and learning for all through new Technologies and Open Educational Resources*. Communication from the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013DC0654&from=EN.

European Commission. (2015a). *European Agenda on Migration. State of Play: 14 October 2015.* European Commission Home Affairs. https://home-

affairs.ec.europa.eu/system/files/2016-12/eam_state_of_play_20151014_migration_priority_en.pdf

European Commission. (2015b). *Review of the European Neighborhood Policy*. Communication from the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. https://neighbourhood-enlargement.ec.europa.eu/system/files/2019-01/151118_joint-communication_review-of-the-enp_en.pdf

European Commission. (2016). *Action Plan on the integration of third country nationals*. Communication from the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016DC0377&qid=1632298272980

European Commission. (2017a). *Call for tenders: Erasmus + Virtual Exchanges (EVE)*. (N° EACEA/2017/05). Education, Audiovisual and Culture Executive Agency. https://eacea.ec.europa.eu/sites/eacea-site/files/tender-specifications_eve.pdf

European Commission. (2017b). *OpenEdu Framework*. JRC Science for Policy Report. https://joint-research-centre.ec.europa.eu/what-open-education/openedu-framework-and-guidelines_en

European Commission. (2017c). *Strengthening European Identity through Education and Culture. The European Commission's contribution to the Leaders' meeting in Gothenburg.* Communication from the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2017%3A673%3AFIN

European Commission. (2018). *Digital Education Action Plan*. Communication from

the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A22%3AFIN

European Commission. (2020a). A*chieving the European Education Area by 2025.* Communication from the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0625

European Commission. (2020b). *Digital Education Action Plan [2021-2027]. Resetting education and training for the digital age.* European Education Area. https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en

European Commission. (2020c). *Digital solutions during the pandemic*. European Commission. https://commission.europa.eu/strategy-and-policy/coronavirus-response/digital-solutions-during-pandemic_en

European Commission. (2020d). *Erasmus+ Programme Guide*. Erasmus+ EU programme for education, training, youth and sport https://ec.europa.eu/programmes/erasmus-plus/resources/documents/erasmus-programme-guide-2020_en

European Commission. (2022). *OERs.* EPALE. https://epale.ec.europa.eu/en/content/oer

European Parliament. (2022). *Walls and fences at EU borders*. Think Tank European Parliament. https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2022)733692

Faist, T. (2012). Toward a Transnational Methodology: Methods to Address

Methodological Nationalism, Essentialism, and Positionality. *Revue Européenne Des Migrations Internationales*, *28*(1), 51–70. https://doi.org/10.4000/remi.5761

Farrow, R. (2017). Open education and critical pedagogy. *Learning, Media and Technology*, *42*(2), 130–146. https://doi.org/10.1080/17439884.2016.1113991

Faulkner, R. (2009). Improvising on Sensitizing Concepts. In A. J. Puddephatt, W. Shaffir, & S. W. Kleinknecht (Eds.), *Ethnographies Revisited* (pp. 99–111). Routledge.

Fenwick, T. (2016). Social media, professionalism and higher education: a sociomaterial consideration. *Studies in Higher Education*, *41*(4), 664–677. https://doi.org/10.1080/03075079.2014.942275

Fenwick, T., & Landri, P. (2012). Materialities, Textures and Pedagogies: Socio-material Assemblages in Education. *Pedagogy, Culture and Society*, *20*(1), 1–7. https://doi.org/10.1080/14681366.2012.649421

Ferreira, G. M. dos S., & Lemgruber, M. S. (2019). Great expectations: a critical perspective on Open Educational Resources in Brazil. *Learning, Media and Technology*, *44*(3), 315–326. https://doi.org/10.1080/17439884.2019.1639190

Freeman, M. (2020). *Modes of Thinking for Qualitative Data Analysis*. Routledge.

Fuller, M., & Goffey, A. (2012). Digital Infrastructures and the Machinery of Topological Abstraction. *Theory, Culture & Society*, *29*(5), 311–333. https://doi.org/10.1177/0263276412450466

Funes, M., & Mackness, J. (2018). When inclusion excludes: a counter narrative of open online education. *Learning, Media and Technology*, *34*(2), 119–138. https://doi.org/10.1080/17439884.2018.1444638

Gallagher, K., Wessels, A., & Ntelioglou, B. Y. (2013). Becoming a networked public: Digital ethnography, youth and global research collectives. *Ethnography and Education*, *8*(2), 177–193. https://doi.org/10.1080/17457823.2013.792507

Gallagher, M., & Breines, M. (2021). Surfacing knowledge mobilities in higher education: reconfiguring the teacher function through automation. *Learning, Media and Technology*, *46*(1), 78–90. https://doi.org/10.1080/17439884.2021.1823411

Galloway, A. R. (2012). *The Interface Effect*. Polity Press

Gašević, D., Dawson, S., & Siemens, G. (2015). Let's not forget: Learning analytics are about learning. *TechTrends*, *59*(1), 64–71. https://doi.org/10.1007/s11528-014-0822-x

Gillespie, T. (2017). *The Platform Metaphor, Revisited.* Digital Society Blog. https://www.hiig.de/en/the-platform-metaphor-revisited/

Goglio, V. (2022). *The Diffusion and Social Implications of MOOCs. A Comparative Study of the USA and Europe.* Routledge.

Goriunova, O. (2019). The Digital Subject: People as Data as Persons. *Theory, Culture and Society*, *36*(6), 125–145. https://doi.org/10.1177/0263276419840409

Gorur, R., Hamilton, M., Lundahl, C., & Sjödin, E. S. (2019). Politics by other means? STS and research in education. *Discourse*, *40*(1), 1–15. https://doi.org/10.1080/01596306.2018.1549700

Gorwa, R. (2019). What is platform governance? *Information, Communication & Society*, *22*(6), 854–871. https://doi.org/10.1080/1369118X.2019.1573914

Gourlay, L. (2015). Open education as a 'heterotopia of desire.' *Learning, Media and Technology, 40*(3), 310–327. https://doi.org/10.1080/17439884.2015.1029941

Gourlay, L. (2022). Presence, Absence, and Alterity: Fire Space and Goffman's Selves in Postdigital Education. *Postdigital Science and Education*, *4*(1), 57–69. https://doi.org/10.1007/s42438-021-00265-1

Grommé, F., & Ruppert, E. (2019). Population Geometries of Europe: The Topologies of Data Cubes and Grids. *Science Technology and Human Values*, *45*(2), 235–261. https://doi.org/10.1177/0162243919835302

Gulson, K. N., Lewis, S., Lingard, B., Lubienski, C., Takayama, K., & Webb, P. T. (2017). Policy mobilities and methodology: a proposition for inventive methods in education policy studies. *Critical Studies in Education*, *58*(2), 224–241. https://doi.org/10.1080/17508487.2017.1288150

Gulson, K. N., & Sellar, S. (2018). Emerging data infrastructures and the new topologies of education policy. *Environment and Planning D: Society and Space*, *37*(2), 350–366. https://doi.org/10.1177/0263775818813144

Halkic, B., & Arnold, P. (2019). Refugees and online education: student perspectives on need and support in the context of (online) higher education. *Learning, Media and Technology*, *44*(3), 345–364. https://doi.org/10.1080/17439884.2019.1640739

Hall, R. (2015). For a political economy of massive open online courses. *Learning, Media and Technology*, *40*(3), 265–286. https://doi.org/10.1080/17439884.2015.1015545

Haraway, D. J. (2016). *Staying with the trouble: Making kin in the Chthulucene.* Duke University Press.

Hartong, S. (2016). Between assessments, digital technologies and big data: The growing influence of 'hidden' data mediators in education. *European Educational Research Journal*, *15*(5), 523–536. https://doi.org/10.1177/1474904116648966

Hartong, S. (2018). Towards a topological re-assemblage of education policy? Observing the implementation of performance data infrastructures and 'centers of calculation' in Germany. *Globalisation, Societies and Education*, *16*(1), 134–150. https://doi.org/10.1080/14767724.2017.1390665

Hartong, S. (2021). The power of relation-making: insights into the production and operation of digital school performance platforms in the US. *Critical Studies in Education*, *62*(1), 34–49. https://doi.org/10.1080/17508487.2020.1749861

Hartong, S., & Förschler, A. (2019). Opening the black box of data-based school monitoring: Data infrastructures, flows and practices in state education agencies. *Big Data and Society*, *6*(1), 1–12. https://doi.org/10.1177/2053951719853311

Hartong, S., & Piattoeva, N. (2019). Contextualizing the datafication of schooling–a comparative discussion of Germany and Russia. *Critical Studies in Education*, *62*(2), 227–242. https://doi.org/10.1080/17508487.2019.1618887

Harvey, D. (1989). *The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change.* Blackwell.

Harvey, P. (2012). The Topological Quality of Infrastructural Relation: An Ethnographic Approach. *Theory, Culture & Society*, *29*(5), 76–92. https://doi.org/10.1177/0263276412448827

Hassan, R. (2017). The worldly space: the digital university in network time. *British Journal of Sociology of Education*, *38*(1), 72–82. https://doi.org/10.1080/01425692.2016.1234364

Hayes, S. (2021). *Postdigital Positionality: developing powerful inclusive narratives for learning, teaching, research and policy in Higher Education.* Brill.

Helmond, A. (2015). The Platformization of the Web: Making Web Data Platform Ready. *Social Media + Society*, *1*(2), 1–11.

https://doi.org/10.1177/2056305115603080

Hinchliffe, S., Allen, J., Lavau, S., Bingham, N., & Carter, S. (2013). Biosecurity and the topologies of infected life: From borderlines to borderlands. *Transactions of the Institute of British Geographers*, *38*(4), 531–543. https://doi.org/10.1111/j.1475-5661.2012.00538.x

Hine, C. (2015). *Ethnography for the Internet: Embedded, Embodied and Everyday*. Bloomsbury Publishing.

Howard, L. (2016). An exploration of autonetnography as an eResearch methodology to examine learning and teaching scholarship in Networked Learning. *Electronic Journal of E-Learning*, *14*(5), 322–335. https://academic-publishing.org/index.php/ejel/article/view/1791/1754

Hunt, T. A. (2017). A Network of One's Own: Young Women and the Creation of Youth-only Transnational Feminist Spaces. *Young*, *25*(2), 107–123. https://doi.org/10.1177/1103308816634259

Iliadis, A. (2013). Informational ontology: The meaning of Gilbert Simondon's concept of individuation. *Communication and the New Materialisms, 2*(5), 1–21. https://doi.org/10.7275/R59884XW

Inamorato dos Santos, A., Punie, Y., & Muñoz, J. C. (2016). *Opening Up Education: A Support Framework for Higher Education Institutions.* JRC Science for Policy Report. https://doi.org/10.2791/293408

Ioannou, O. (2018). Opening up design studio education using blended and networked formats. *International Journal of Educational Technology in Higher Education*, *15*(47), 1–16. https://doi.org/10.1186/s41239-018-0129-7

Jacobson, M. J. (2019). Educational complex systems and open, flexible, and distance learning: a complexity theoretical perspective. *Distance Education*, *40*(3), 419–424. https://doi.org/10.1080/01587919.2019.1656152

Jarke, J., & Breiter, A. (2019). Editorial: the datafication of education. *Learning, Media and Technology*, *44*(1), 1–6. https://doi.org/10.1080/17439884.2019.1573833

Jarke, J., & Macgilchrist, F. (2021). Dashboard stories: How narratives told by predictive analytics reconfigure roles, risk and sociality in education. *Big Data and Society*, *8*(1), 1–15. https://doi.org/10.1177/20539517211025561

Jasanoff, S. (2015). Future imperfect: Science, technology, and the imaginations of modernity. In S. Jasanoff & K. Sang-Hyun (Eds.), *Dreamscapes of Modernity. Sociotechnical imaginaries and the fabrication of power.* (pp. 1–47). The University of Chicago Press.

Jensen, C. B., & Morita, A. (2017). Introduction: Infrastructures as ontological experiments. *Ethnos, 82*(4), 615-626. https://doi.org/10.1080/00141844.2015.1107607

Johanes, P., & Thille, C. (2019). The heart of educational data infrastructures = Conscious humanity and scientific responsibility, not infinite data and limitless experimentation. *British Journal of Educational Technology*, *50*(6), 2959–2973. https://doi.org/10.1111/bjet.12862

Kerr, R., & Eradze, M. (2016). MOOCs: A multi-faceted phenomenon. *Italian Journal of Educational Technology*, *24*(2), 126–129. https://doi.org/10.17471/2499-4324/897

Kerr, R., & Merciai, I. (2015). EMMA: Towards multicultural learning. *The EuroCALL Review*, *23*(2), 53–58. https://doi.org/10.4995/eurocall.2016.5696

Khalil, M., & Ebner, M. (2016). Learning Analytics in MOOCs: Can Data Improve Students Retention and Learning? *Proceedings of EdMedia 2016--World Conference on Educational Media and Technology* (pp. 581–588).

Kidd, W. (2013). Investigating the lives of new teachers through ethnographic blogs.

Ethnography and Education, *8*(2), 210–223. https://doi.org/10.1080/17457823.2013.792510

King, I., & Lee, W. (2023). *A Decade of MOOCs and Beyond. Platforms, Policies, Pedagogy, Emphasis on Greater China.* Springer.

Kitchin, R., & Dodge, M. (2011). *Code / Space: Software and Everyday Life*. MIT Press.

Knox, H., Savage, M., & Harvey, P. (2006). Social networks and the study of relations: Networks as method, metaphor and form. *Economy and Society*, *35*(1), 113–140. https://doi.org/10.1080/03085140500465899

Knox, J. (2013a). Five critiques of the open educational resources movement. *Teaching in Higher Education*, *18*(8), 821–832. https://doi.org/10.1080/13562517.2013.774354

Knox, J. (2013b). The Limitations of Access Alone: moving towards open processes in education technology. *Open Praxis*, *5*(1), 21–29. https://doi.org/10.5944/openpraxis.5.1.36

Knox, J. (2014). Digital culture clash "massive" education in the e- learning and Digital Cultures MOOC. *Distance Education*, *35*(2), 165–178. https://doi.org/10.1080/01587919.2014.917704

Knox, J. (2016a). Posthumanism and the MOOC: opening the subject of digital education. *Studies in Philosophy and Education*, *35*(3), 305–320. https://doi.org/10.1007/s11217-016-9516-5

Knox, J. (2016b). What's the Matter with MOOCs? Socio-material Methodologies for Educational Research. In H. Snee, C. Hine, Y. Morey, S. Roberts, & H. Watson (Eds.), *Digital Methods for Social Science. An Interdisciplinary Guide to Research Innovation.* (pp. 175–189). Palgrave Macmillan.

Knox, J. (2017). How goes the revolution? Three themes in the shifting MOOC landscape. In G. Martins dos Santos Ferreira, L. Alexandre da Silva Rosado, &

J. de Sá Carvalho (Eds.), *Educação e Tecnologia : Abordagens Criticas.* (1st ed., pp. 386–408). Universidade Estacio De Sa.

Knox, J. (2018). Beyond the "c" and the "x": Learning with algorithms in massive open online courses (MOOCs). *International Review of Education*, *64*(2), 161–178. https://doi.org/10.1007/s11159-018-9707-0

Knox, J. (2019). Postdigital as (Re)Turn to the Political. *Postdigital Science and Education*, *1*(2), 280–282. https://doi.org/10.1007/s42438-019-00058-7

Knox, J., Bayne, S., MacLeod, H., Ross, J., & Sinclair, C. (2012, August 8). *MOOC pedagogy: the challenges of developing for Coursera.* #ALTC BLOG. https://altc.alt.ac.uk/blog/2012/08/mooc-pedagogy-the-challenges-of-developing-for-coursera/

Knox, J., Williamson, B., & Bayne, S. (2020). Machine behaviourism: future visions of 'learnification' and 'datafication' across humans and digital technologies. *Learning, Media and Technology*, *45*(1), 31–45. https://doi.org/10.1080/17439884.2019.1623251

Lamb, J., & Ross, J. (2021). Lecture capture, social topology, and the spatial and temporal arrangements of UK universities. *European Educational Research Journal*, *21*(6), 961 –982. https://doi.org/10.1177/1474904121993982

Landri, P. (2013). Mobilising ethnographers investigating technologised learning. *Ethnography and Education*, *8*(2), 239–254. https://doi.org/10.1080/17457823.2013.792512

Landri, P. (2015). The sociomateriality of education policy. *Discourse, 36*(4), 596–609. https://doi.org/10.1080/01596306.2014.977019

Landri, P., & Neumann, E. (2014). Mobile sociologies of education. *European Educational Research Journal*, *13*(1), 1–8. https://doi.org/10.2304/eerj.2014.13.1.1

Larkin, B. (2013). The Politics and Poetics of Infrastructure. *Annual Review of Anthropology, 42*(1), 327–343. https://doi.org/10.1146/annurev-anthro-092412-155522

Larmuseau, C., Evens, M., Elen, J., Van Den Noortgate, W., Desmet, P., & Depaepe, F. (2018). The Relationship Between Acceptance, Actual Use of a Virtual Learning Environment and Performance: An Ecological Approach. *Journal of Computers in Education*, *5*(1), 95–111. https://doi.org/10.1007/s40692-018-0098-9

Lascoumes, P., & Le Gales, P. (2007). Introduction: Understanding public policy through its instruments - From the nature of instruments to the sociology of public policy instrumentation. *Governance*, *20*(1), 1–21. https://doi.org/10.1111/j.1468-0491.2007.00342.x

Lash, S. (2012). Deforming the Figure: Topology and the Social Imaginary. *Theory, Culture & Society*, *29*(5), 261–287. https://doi.org/10.1177/0263276412448829

Latour, B. (1986). Visualization and Cognition: Thinking with eyes and hands. *Knowledge and Society Studies in the Sociology of Culture Past and Present*, *6*, 1–40. https://hci.ucsd.edu/10/readings/Latour(1986).pdf

Latour, B. (2005a). *Reassembling the Social.* Oxford University Press.

Latour, B. (2005b). Critical distance or critical proximity. Unpublished Manuscript.. http://www.bruno-latour.fr/sites/default/files/p-113-haraway.pdf.

Latour, B., Jensen, P., Venturini, T., Grauwin, S., & Boullier, D. (2012). "The whole is always smaller than its parts" - a digital test of Gabriel Tardes' monads. *British Journal of Sociology*, *63*(4), 590–615. https://doi.org/10.1111/j.1468-4446.2012.01428.x

Laurillard, D. (2016). The educational problem that MOOCs could solve:

Professional development for teachers of disadvantaged students. *Research in Learning Technology*, *24*, 1–17. https://doi.org/10.3402/rlt.v24.29369

Law, J. (1999). After ANT: Complexity, Naming and Topology. *The Sociological Review*, *47*(1), 1–14. https://doi.org/10.1111/j.1467-954X.1999.tb03479.x

Law, J. (2004). *After method: mess in social science research*. Routledge.

Law, J. (2011). Collateral realities. In F. Dominguez Rubio & P. Baert (Eds.), *The Politics of Knowledge* (pp. 156–178.). Routledge.

Law, J., & Mol, A. (2001). Situating technoscience: An inquiry into spatialities. *Environment and Planning D: Society and Space*, *19*(5), 609–621. https://doi.org/10.1068/d243t

Lawn, M. (2001). Borderless Education: Imagining a European education space in a time of brands and networks. *Discourse: Studies in the Cultural Politics of Education*, *22*(2), 173–184. https://doi.org/10.1080/0159630012007235

Lazetic, P., Souto-Otero, M., & Shields, R. (2015). *OpenCases: catalogue of mini cases on open education in Europe*. JRC Technical Reports. https://doi.org/10.2791/778862

Leaton Gray, S. (2017). The social construction of time in contemporary education: implications for technology, equality and Bernstein's 'conditions for democracy.' *British Journal of Sociology of Education*, *38*(1), 60–71. https://doi.org/10.1080/01425692.2016.1234366

Lee, K. (2021). Openness and innovation in online higher education: a historical review of the two discourses. *Open Learning*, *36*(2), 112–132. https://doi.org/10.1080/02680513.2020.1713737

Lemke, J. L. (2002). Travels in hypermodality. *Visual Communication*, *1*(3), 299–325. https://doi.org/10.1177/147035720200100303

Lemke, J. L. (2005). Multimedia Genres and Traversals. *Folia Linguistica*, *39*(1–2), 45–56. https://doi.org/10.1515/flin.2005.39.1-2.45

Lewis, S. (2016). "Following the policy": A topological account of Fast Policy and new relationalities. *Discourse: Studies in the Cultural Politics of Education*, *38*(2), 7–13. https://doi.org/10.1080/01596306.2016.1226464

Lewis, S. (2020a). 'Becoming European'? Respatialising the European Schools System through PISA for Schools. *International Studies in Sociology of Education*, *29*(1–2), 85–106. https://doi.org/10.1080/09620214.2019.1624593

Lewis, S. (2020b). Providing a platform for 'what works': platform-based governance and the reshaping of teacher learning through the OECD's PISA4U. *Comparative Education*, *56*(4), 484–502. https://doi.org/10.1080/03050068.2020.1769926

Lewis, S. (2021). The turn towards policy mobilities and the theoretical-methodological implications for policy sociology. *Critical Studies in Education*, *62*(3), 322–337. https://doi.org/10.1080/17508487.2020.1808499

Lewis, S., & Decuypere, M. (2023). 'Out of time': Constructing teacher professionality as a perpetual project on the eTwinning digital platform. *Tertium Comparationis*, *29*(1), 22–47. https://doi.org/10.31244/tc.2023.01.02

Lewis, S., & Hartong, S. (2021). New shadow professionals and infrastructures around the datafied school: Topological thinking as an analytical device. *European Educational Research Journal*, *21*(6), 946–960. https://doi.org/10.1177/14749041211007496

Lewis, S., & Hogan, A. (2019). Reform first and ask questions later? The implications of (fast) schooling policy and 'silver bullet' solutions. *Critical Studies in Education*, *60*(1), 1–18. https://doi.org/10.1080/17508487.2016.1219961

Lewis, S., Sellar, S., & Lingard, B. (2016). PISA for Schools: Topological Rationality and New Spaces of the OECD's Global Educational Governance. *Comparative Education Review*, *60*(1), 27–57. https://doi.org/10.1086/684458

Light, B., Burgess, J., & Duguay, S. (2018). The walkthrough method: An approach to the study of apps. *New Media and Society*, *20*(3), 881–900. https://doi.org/10.1177/1461444816675438

Liyanagunawardena, T. R., Adams, A. A., & Williams, S. A. (2013). MOOCs: a systematic study of the published literature 2008- 2012. *The International Review of Research in Open and Distance Learning*, *14*(3), 202–227. https://doi.org/10.3329/bjms.v12i4.16658

Lumino, R., & Landri, P. (2020). Network time for the European Higher Education Area. *Educational Philosophy and Theory*, *52*(6), 653–663. https://doi.org/10.1080/00131857.2019.1708328

Lury, C., Parisi, L., & Terranova, T. (2012). Introduction: The Becoming Topological of Culture. *Theory, Culture & Society*, *29*(5), 3–35. https://doi.org/10.1177/0263276412454552

Lury, C., & Wakeford, N. (2012). Introduction: A perpetual inventory. In C. Lury & N. Wakeford (Eds.), *Inventive Methods: The happening of the social* (pp. 1–24). Routledge.

Lynch, T. L. (2015). Where the Machine Stops: Software as Reader and the Rise of New Literatures. *Research in the Teaching of English*, *49*(3), 297–304. https://www.proquest.com/scholarly-journals/forum-where-machine-stops-software-as-reader-rise/docview/1657416892/se-2

M'charek, A., Schramm, K., & Skinner, D. (2014). Topologies of Race: Doing territory, population and identity in Europe. *Science Technology and Human Values*, *39*(4), 468–487. https://doi.org/10.1177/0162243913509493

Macgilchrist, F. (2019). Cruel optimism in edtech: when the digital data practices of educational technology providers inadvertently hinder educational equity. *Learning, Media and Technology*, *44*(1), 77–86. https://doi.org/10.1080/17439884.2018.1556217

Macgilchrist, F., Allert, H., & Bruch, A. (2020). Students and society in the 2020s. Three future 'histories' of education and technology. Learning, Media and Technology, 45(1), 76-89. https://doi.org/10.1080/17439884.2019.1656235

Macleod, H., Sinclair, C., Haywood, J., & Woodgate, A. (2016). Massive Open Online Courses: designing for the unknown learner. *Teaching in Higher Education*, *21*(1), 13–24. https://doi.org/10.1080/13562517.2015.1101680

Maintz, J. (2008). Synthesizing the face-to-face experience: E-learning practices and the constitution of place online. *Social Geography*, *3*(1), 1–10. https://doi.org/10.5194/sg-3-1-2008

Mangez, E., & Vanden Broeck, P. (2020). The history of the future and the shifting forms of education. *Educational Philosophy and Theory*, *52*(6), 676–687. https://doi.org/10.1080/00131857.2019.1708329

Marín, V. I., Zawacki-Richter, O., Aydin, C. H., Bedenlier, S., Bond, M., Bozkurt, A., Conrad, D., Jung, I., Kondakci, Y., Prinsloo, P., Roberts, J., Veletsianos, G., Xiao, J., & Zhang, J. (2022). Institutional Measures for Supporting OER in Higher Education: An International Case-Based Study. *Open Education Studies*, *4*(1), 310–321. https://doi.org/10.1515/edu-2022-0019

Marres, N. (2012a). On Some Uses and Abuses of Topology in the Social Analysis of Technology (Or the Problem with Smart Meters). *Theory, Culture & Society*, *29*(5), 288–310. https://doi.org/10.1177/0263276412454460

Marres, N. (2012b). The redistribution of methods: On intervention in digital social research, broadly conceived. *Sociological Review*, *60*(1), 139–165.

https://doi.org/10.1111/j.1467-954X.2012.02121.x

Marres, N. (2017). *Digital Sociology: The Reinvention of Social Research*. Polity Press.

Marres, N., & Gerlitz, C. (2016). Interface methods: Renegotiating relations between digital social research, STS and sociology. *Sociological Review*, *64*(1), 21–46. https://doi.org/10.1111/1467-954X.12314

Martin, A.D., & Kamberelis, G. (2013). Mapping not tracing: Qualitative educational research with political teeth. *International Journal of Qualitative Studies in Education*, *26*(6), 668–679. https://doi.org/10.1080/09518398.2013.788756

Martin, L., & Secor, A. J. (2014). Towards a post-mathematical topology. *Progress in Human Geography*, *38*(3), 420–438. https://doi.org/10.1177/0309132513508209

Masschelein, J., & Simons, M. (2018). The University as Pedagogical Form: Public Study, Responsibility, Mondialisation. In S. Ramaekers & N. Hodgson (Eds.), *Past, Present, and Future Possibilities for Philosophy and History of Education* (pp. 47–61).

McGregor, J. (2003). Making Spaces: Teacher workplace topologies. *Pedagogy, Culture and Society*, *11*(3), 353–377. https://doi.org/10.1080/14681360300200179

Mezzadra, S., & Neilson, B. (2012). Between Inclusion and Exclusion: On the Topology of Global Space and Borders. *Theory, Culture & Society*, *29*(5), 58–75. https://doi.org/10.1177/0263276412443569

Michael, M., & Rosengarten, M. (2012). HIV, Globalization and Topology: Of Prepositions and Propositions. *Theory, Culture & Society*, *29*(5), 93–115. https://doi.org/10.1177/0263276412443567

Milligan, C., Littlejohn, A., & Margaryan, A. (2013). Patterns of engagement in

connectivist MOOCs. *MERLOT Journal of Online Learning and Teaching*, *9*(2), 149–159. http://jolt.merlot.org/vol9no2/milligan_0613.htm

Minca, C., & Vaughan-Williams, N. (2012). Carl Schmitt and the concept of the border. *Geopolitics*, *17*(4), 756–772. https://doi.org/10.1080/14650045.2012.660578

Moe, R. (2015). OER as online edutainment resources: a critical look at open content, branded content, and how both affect the OER movement. *Learning, Media and Technology*, *40*(3), 350–364. https://doi.org/10.1080/17439884.2015.1029942

Mol, A., & Law, J. (1994). Regions, Networks and Fluids: Anaemia and Social Topology. *Social Studies of Science*, *24*, 641–671. https://doi.org/10.1177/030631279402400402

Mol, A., & Law, J. (2005). Boundary variations: An introduction. *Environment and Planning D: Society and Space*, *23*(5), 637–642. https://doi.org/10.1068/d350t

MOOS. (2013). MOOS Project. http://www.moos-online.eu/project/

Moutselos, M. (2023). Exclusionary Europeans: Radical-right party construction of Europeanness in response to the 2015 refugee 'crisis.' *Comparative European Politics*. Advance Online Publication. https://doi.org/10.1057/s41295-023-00333-9

Mukherjee, S. (2017). Troubling Positionality: Politics of "Studying Up" in Transnational Contexts. *Professional Geographer*, *69*(2), 291–298. https://doi.org/10.1080/00330124.2016.1208509

Nail, T. (2016). *Theory of The Border*. Oxford University Press.

Neary, M., & Winn, J. (2012). Open education: Common (s), commonism and the new common wealth. *Ephemera: Theory &Politics in Organization, 12*(4), 406-422. https://ephemerajournal.org/contribution/open-education-commons-

commonism-and-new-common-wealth

Nespor, J. (1994). *Knowledge in Motion: Space, Time and Curriculum in Undergraduate Physics and Management*. The Falmer Press.

Nic Craith, M. (2009). Writing Europe: A dialogue of "liminal Europeans." *Social Anthropology*, *17*(2), 198–208. https://doi.org/10.1111/j.1469-8676.2009.00069.x

November, V., Camacho-Hübner, E., & Latour, B. (2010). Entering a risky territory: Space in the age of digital navigation. *Environment and Planning D: Society and Space*, *28*(4), 581–599. https://doi.org/10.1068/d10409

Nóvoa, A., & Lawn, M. (2002). *Fabricating Europe: The formation of an education space.* Springer.

O'Dowd, R. (2018). From telecollaboration to virtual exchange: state-of-the-art and the role of UNICollaboration in moving forward. *Journal of Virtual Exchange, 1*, 1–23. https://doi.org/10.14705/rpnet.2018.jve.1

Oliver, M. (2015). From openness to permeability: reframing open education in terms of positive liberty in the enactment of academic practices. *Learning, Media and Technology*, *40*(3), 365–384. https://doi.org/10.1080/17439884.2015.1029940

Ootes, S. T. C., Pols, A. J., Tonkens, E. H., & Willems, D. L. (2013). Where is the citizen? Comparing civic spaces in long-term mental healthcare. *Health and Place*, *22*, 11–18. https://doi.org/10.1016/j.healthplace.2013.02.008

OpenupEd. (2022). *The MOOC portal for higher education.*OpenupEd. https://www.openuped.eu/

Opitz, S., & Tellmann, U. (2015). Europe as Infrastructure: Networking the Operative Community. *South Atlantic Quarterly*, *114*(1), 171–190. https://doi.org/10.1215/00382876-2831356

Pardo, A. (2018). A feedback model for data-rich learning experiences. *Assessment and Evaluation in Higher Education*, *43*(3), 428–438. https://doi.org/10.1080/02602938.2017.1356905

Pardo, A., Jovanovic, J., Dawson, S., Gašević, D., & Mirriahi, N. (2019). Using learning analytics to scale the provision of personalised feedback. *British Journal of Educational Technology*, *50*(1), 128–138. https://doi.org/10.1111/bjet.12592

Parisi, L. (2012). Digital Design and Topological Control. *Theory, Culture & Society*, *29*(5), 165–192. https://doi.org/10.1177/0263276412443568

Parker, N., & Vaughan-Williams, N. (2012). Critical Border Studies: Broadening and Deepening the 'Lines in the Sand'' Agenda.' *Geopolitics*, *17*(4), 727–733. https://doi.org/10.1080/14650045.2012.706111

Parker Webster, J., & Marques da Silva, S. (2013). Doing educational ethnography in an online world : methodological challenges, choices and innovations. *Ethnography and Education*, *8*(2), 123–130. https://doi.org/10.1080/17457823.2013.792508

Peck, J., & Theodore, N. (2015). *Fast policy: Experimental statecraft at the thresholds of neoliberalism.* The University of Minnesota Press.

Pérez-Sanagustin, M., Pérez-Álvarez, R., Maldonado-Mahauad, J., Villalobos, E., Hilliger, I., Hernández, J., Diego Sapunar, Manuel Moreno-Marcos, P., Muñoz-Merino, P. J., Delgado Kloos, C., Imaz, J. (2021). Can Feedback based on Predictive Data Improve Learners' Passing Rates in MOOCs? A Preliminary Analysis. *Proceedings of the 8th ACM Conference on Learning @ Scale*, 339–342. https://doi.org/10.1145/3430895.3460991

Perifanou, M., & Economides, A. A. (2022). Measuring quality, popularity, demand and usage of Repositories of Open Educational Resources (ROER): a study on

Thirteen popular ROER. *Open Learning*. Advance Online Publication. https://doi.org/10.1080/02680513.2022.2033114

Perrotta, C., Czerniewicz, L., & Beetham, H. (2016). The rise of the video-recorder teacher: the sociomaterial construction of an educational actor. *British Journal of Sociology of Education*, *37*(8), 1251–1267. https://doi.org/10.1080/01425692.2015.1044068

Perrotta, C., Gulson, K. N., Williamson, B., & Witzenberger, K. (2021). Automation, APIs and the distributed labour of platform pedagogies in Google Classroom. *Critical Studies in Education*, *62*(1), 97–113. https://doi.org/10.1080/17508487.2020.1855597

Perrotta, C., & Williamson, B. (2018). The social life of Learning Analytics: cluster analysis and the 'performance' of algorithmic education. *Learning, Media and Technology*, *43*(1), 3–16. https://doi.org/10.1080/17439884.2016.1182927

Peter, S., & Deimann, M. (2013). On the role of openness in education: A historical reconstruction. *Open Praxis*, *5*(1), 7–14. https://doi.org/10.5944/openpraxis.5.1.23

Peters, M. A. (2014). Openness and the Intellectual Commons. *Open Review of Educational Research*, *1*(1), 1–7. https://doi.org/10.1080/23265507.2014.984975

Piattoeva, N., Klutas, A., & Suominen, O. (2019). Making and mobilizing contexts in policy and research. In R. Gorur, S. Sellar, & G. Steiner-Khamsi (Eds.), *World Yearbook of Education 2019* (pp. 202–218). https://doi.org/10.4324/9781315147338

Piattoeva, N., & Saari, A. (2020). Rubbing against data infrastructure(s): methodological explorations on working with(in) the impossibility of exteriority. *Journal of Education Policy*, *37*(2), 165–185. https://doi.org/10.1080/02680939.2020.1753814

Plájás, I. Z., M'charek, A., & van Baar, H. (2019). Knowing "the Roma": Visual technologies of sorting populations and the policing of mobility in Europe. *Environment and Planning D: Society and Space*, *37*(4), 589–605. https://doi.org/10.1177/0263775819837291

Plantin, J. C., Lagoze, C., Edwards, P. N., & Sandvig, C. (2018). Infrastructure studies meet platform studies in the age of Google and Facebook. *New Media and Society*, *20*(1), 293–310. https://doi.org/10.1177/1461444816661553

Poell, T., & Van Dijck, J. (2016). Constructing Public Space: Global Perspectives on Social Media and Popular Contestation. *International Journal of Communication*, *10*, 226–234. https://ijoc.org/index.php/ijoc/article/view/4984

Pollozek, S., & Passoth, J. H. (2019). Infrastructuring European migration and border control: The logistics of registration and identification at Moria hotspot. *Environment and Planning D: Society and Space*, *37*(4), 606–624. https://doi.org/10.1177/0263775819835819

Ponti, M. (2014). Self-directed learning and guidance in non-formal open courses. *Learning, Media and Technology*, *39*(2), 154–168. https://doi.org/10.1080/17439884.2013.799073

Postma, D. (2012). Education as Sociomaterial Critique. *Pedagogy, Culture and Society*, *20*(1), 137–156. https://doi.org/10.1080/14681366.2012.649419

Prince, R. (2015). The spaces in between: Mobile policy and the topographies and topologies of the technocracy. *Environment and Planning D: Society and Space*, *34*(3), 420–437. https://doi.org/10.1177/0263775815618401

Rabinow, P., & Stavrianakis, A. (2016). *Movement space and cases to the test*. *6*(1), 403–431. http://dx.doi.org/10.14318/hau6.1.021

Rambe, P., & Moeti, M. (2017). Disrupting and democratising higher education provision or entrenching academic elitism: towards a model of MOOCs

adoption at African universities. *Educational Technology Research and Development*, *65*(3), 631–651. https://doi.org/10.1007/s11423-016-9500-3

Ravitch, S. M., & Mittenfelner Carl, N. (2021). *Qualitative research: Bridging the conceptual, theoretical, and methodological*. Sage Publications.

Rimpiläinen, S. (2015). Multiple enactments of method, divergent hinterlands and production of multiple realities in educational research. *International Journal of Qualitative Studies in Education*, *28*(2), 137–150. https://doi.org/10.1080/09518398.2013.855341

Ritter, C. S. (2021). Rethinking digital ethnography: A qualitative approach to understanding interfaces. *Qualitative Research*, 22(6), 916-932. https://doi.org/10.1177/14687941211000540

Robertson, S. L. (2011). The new spatial politics of (re)bordering and (re)ordering the state-education-citizen relation. *International Review of Education*, *57*(3–4), 277–297. https://doi.org/10.1007/s11159-011-9216-x

Robinson, B. (2022). Governance on, with, behind, and beyond the Discord platform: A study of platform practices in an informal learning context. *Learning, Media and Technology, 48*(1), 81-94. https://doi.org/10.1080/17439884.2022.2052312

Rogers, R. (2012). Mapping and the Politics of Web Space. *Theory, Culture & Society*, *29*(5), 193–219. https://doi.org/10.1177/0263276412450926

Romito, M., Gonçalves, C., & De Feo, A. (2019). Digital devices in the governing of the European Education Space: The case of SORPRENDO software for career guidance. *European Educational Research Journal*, *19*(3) 204–224. https://doi.org/10.1177/1474904118822944

Ross, J. (2014). Engaging with "Webness" in Online Reflective Writing Practices. *Computers and Composition*, *34*, 96–109.

https://doi.org/10.1016/j.compcom.2014.09.007

Ross, J. (2017). Speculative method in digital education research. *Learning, Media and Technology*, *42*(2), 214–229. https://doi.org/10.1080/17439884.2016.1160927

Ross, J., & Collier, A. (2016). Complexity, Mess, and Not-Yetness: Teaching Online with Emerging Technologies. In G. Veletsianos (Ed.), *Emergence and innovation in digital learning* (pp. 17–34). https://doi.org/10.4324/9781315742298-7

Ross, J., Gallagher, M. S., & Macleod, H. (2013). Making distance visible: Assembling nearness in an online distance learning programme. *International Review of Research in Open and Distance Learning*, *14*(4), 51–67. https://doi.org/10.19173/irrodl.v14i4.1545

Ross, J., & Sheail, P. (2017). The 'campus imaginary': online students' experience of the masters dissertation at a distance. *Teaching in Higher Education*, *22*(7), 839–854. https://doi.org/10.1080/13562517.2017.1319809

Ross, J., Sinclair, C., Knox, J., Bayne, S., & Macleod, H. (2014). Teacher Experiences and Academic Identity: The Missing Components of MOOC Pedagogy. *Journal of Online Learning and Teaching*, *10*(1), 57–69. https://jolt.merlot.org/vol10no1/ross_0314.pdf

Roth, W. M., & Jornet, A. (2018). From Object-Oriented to Fluid Ontology: a Case Study of the Materiality of Design Work in Agile Software Development. *Computer Supported Cooperative Work: CSCW: An International Journal*, *27*(1), 37–75. https://doi.org/10.1007/s10606-017-9297-6

Rotman, B. (2012). Topology, Algebra, Diagrams. *Theory, Culture & Society, 29*(4-5), 247-260. https://doi.org/10.1177/0263276412444472

Ruppert, E. (2012). The Governmental Topologies of Database Devices. *Theory,*

Culture & Society, *29*(5), 116–136. https://doi.org/10.1177/0263276412439428

Ruppert, E., Law, J., & Savage, M. (2013). Reassembling social science methods: The challenge of digital devices. *Theory, culture & society, 30*(4), 22-46. https://doi.org/10.1177/0263276413484941

Sabadie, J. M. A., Muñoz, J. C., Puni, Y., Redecker, C., & Vuorikari, R. (2014). OERs: a European Policy Perspective. In Littlejohn, A., & Pegler, C. (Eds.), *Reusing Open Resources. Learning in Open Networks for Work, Life and Education* (pp. 78-89). Routledge.

Sager, M., & Zuiderent-Jerak, T. (2021). Knowing Times: Temporalities of Evidence for Implantable Cardioverter Defibrillators. *Science Technology and Human Values*, *46*(3), 628–654. https://doi.org/10.1177/0162243920941591

Sánchez-Querubín, N., & Rogers, R. (2018). Connected Routes: Migration Studies with Digital Devices and Platforms. *Social Media + Society*, *4*(1), 1–13. https://doi.org/10.1177/2056305118764427

Savage, G. C., & Lewis, S. (2018). The phantom national ? Assembling national teaching standards in Australia's federal system. *Journal of Education Policy*, *33*(1), 118–142. https://doi.org/10.1080/02680939.2017.1325518

Schraube, E. (2013). First-person perspective and sociomaterial decentering: Studying technology from the standpoint of the subject. *Subjectivity*, *6*(1), 12–32. https://doi.org/10.1057/sub.2012.28

Scott, J. W. (2020). *A Research Agenda for Border Studies*. Edward Elgar Publishing.

Seaver, N. (2017). Algorithms as culture: Some tactics for the ethnography of algorithmic systems. *Big Data & Society*, *4*(2), 1–12. https://doi.org/10.1177/2053951717738104

Sellar, S. (2015). Data infrastructure: a review of expanding accountability systems

and large-scale assessments in education. *Discourse*, *36*(5), 765–777. https://doi.org/10.1080/01596306.2014.931117

Selwyn, N. (2011). *Education and Technology: Key Issues and Debates*. Continuum.

Selwyn, N. (2016). Minding our language: why education and technology is full of bullshit … and what might be done about it†. *Learning, Media and Technology*, *41*(3), 437–443. https://doi.org/10.1080/17439884.2015.1012523

Selwyn, N. (2019). What's the problem with learning analytics? *Journal of Learning Analytics*, *6*(3), 11–19. https://doi.org/10.18608/jla.2019.63.3

Selwyn, N., Hillman, T., Eynon, R., Ferreira, G., Knox, J., Macgilchrist, F., & Sancho-Gil, J. M. (2020). What's next for Ed-Tech? Critical hopes and concerns for the 2020s. *Learning, Media and Technology*, *45*(1), 1–6. https://doi.org/10.1080/17439884.2020.1694945

Sha, X. W. (2012). Topology and Morphogenesis. *Theory, Culture &Society*, *29*(4/5), 220–246. https://doi.org/10.1177/0263276412443570

Shah, D. (2017). *By The Numbers: MOOCs in 2017.* Class Central. https://www.class-central.com/report/mooc-stats-2017/

Shah, D. (2021). *By The Numbers: MOOCs in 2021.* Class Central. https://www.classcentral.com/report/mooc-stats-2021/

Sharing Perspectives Foundation (2020). *Erasmus+ Virtual Exchange.* SPF. https://sharingperspectivesfoundation.com/erasmus-virtual-exchange/

Shawn. (2012, October 2013). *On being theory agnostic.* Oregon State University.https://blogs.oregonstate.edu/freechoicelab/2012/10/31/983/

Sheail, P. (2018). The digital university and the shifting time–space of the campus. *Learning, Media and Technology*, *43*(1), 56–69. https://doi.org/10.1080/17439884.2017.1387139

Sheller, M. (2018). Media, Materiality, Mobility. In K. Fast, A. Jansson, J. Lindell, L. Ryan, & M. Bengtsson (Eds.), *Geomedia Studies: Spaces and Mobilities in Mediatized Worlds* (pp. 75–91).

Siemens, G. (2013). Learning Analytics: The Emergence of a Discipline. *American Behavioral Scientist*, *57*(10), 1380–1400. https://doi.org/10.1177/0002764213498851

Siemens, G. (2012, January 20). *Connectivism: A Learning Theory for the Digital Age.* ELearnspace.org https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=f87c61b964e32786e06c969fd24f5a7d9426f3b4

Sørensen, E. (2009). *The Materiality of Learning: Technology and Knowledge in Educational Practice*. Cambridge University Press.

Souto-Otero, M. (2019). Private companies and policy-making: Ideological repertoires and concealed geographies in the evaluation of European education policies. *European Educational Research Journal*, *18*(1), 34–53. https://doi.org/10.1177/1474904118804745

Souto-otero, M., & Beneito-Montagut, R. (2016). From governing through data to governmentality through data: Artefacts, strategies and the digital turn. *European Educational Research Journal*, *15*(1), 14–33. https://doi.org/10.1177/1474904115617768

Srinivasan, P. (2017). What we see is what we choose: seers and seekers with diversity. *Pedagogy, Culture and Society*, *25*(2), 293–307. https://doi.org/10.1080/14681366.2016.1255243

Star, S. L. (1999). The Ethnography of Infrastructure. *American Behavioral Scientist*, *43*(4), 377–391. https://doi.org/0803973233

Star, S. L. (2010). This is not a boundary object: Reflections on the origin of a

concept. *Science Technology and Human Values*, *35*(5), 601–617. https://doi.org/10.1177/0162243910377624

Star, S. L., & Griesemer, J. R. (1989). Institutional Ecology, "Translations" and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science*, *19*, 387–420. https://doi.org/10.1177/030631289019003001

Star, S. L., & Ruhleder, K. (1996). Steps Toward Design an Ecology and Access of Infrastructure. *Information Systems Research*, *7*(1), 111–134. https://doi.org/10.1287/isre.7.1.111

Star, S. L., & Bowker, G. C. (2002). How to infrastructure. In L. A. Lievrouw & S. Livingston (Eds.), *Handbook of new media – Social shaping and consequences of ICTs* (pp. 151–162). SAGE Publications Ltd.

Storme, T., Vansieleghem, N., Devleminck, S., Masschelein, J., & Simons, M. (2016). The emerging pedagogy of MOOCs, the educational design of technology and practices of study. *Journal of Computers in Education*, *3*(3), 309–328. https://doi.org/10.1007/s40692-016-0070-5

Stracke, C. M. (2018). How can Open Education improve learning quality and achieve impact for learners, organizations and in society ? In T. Amiel (Ed.), *Utopias and Dystopias in Education*. UNICAMP.

Tait, A. (1996). Open and distance learning policy in the European Union 1985–1995. *Higher Education Policy*, *9*(3), 221–238. https://doi.org/10.1016/S0952-8733(96)00014-1

Terras, M. M., & Ramsay, J. (2015). Massive open online courses (MOOCs): Insights and challenges from a psychological perspective. *British Journal of Educational Technology*, *46*(3), 472–487. https://doi.org/10.1111/bjet.12274

Thompson, G. (2017). Computer adaptive testing, big data and algorithmic

approaches to education. *British Journal of Sociology of Education*, *38*(6), 827–840. https://doi.org/10.1080/01425692.2016.1158640

Thompson, G., & Cook, I. (2015). Becoming-topologies of education: Deformations, networks and the database effect. *Discourse: Studies in the Cultural Politics of Education, 36*(5), 732–748. https://doi.org/10.1080/01596306.2014.890411

Thompson, G., & Cook, I. (2017). The logic of data-sense: thinking through Learning Personalisation. *Discourse: Studies in the Cultural Politics of Education*, *38*(5), 740–754. https://doi.org/10.1080/01596306.2016.1148833

Thompson, T. L. (2016). Digital doings: curating work–learning practices and ecologies. *Learning, Media and Technology*, *41*(3), 480–500. https://doi.org/10.1080/17439884.2015.1064957

Tkacz, N., Henrique da Mata Martins, M., Porto de Albuquerque, J., Horita, F., & Dolif Neto, G. (2021). Data diaries: A situated approach to the study of data. *Big Data and Society*, *8*(1), 1–16. https://doi.org/10.1177/2053951721996036

Topali, P., Ortega-Arranz, A., Monés-Martínez, A., & Villagrá-Sobrino, S. L. (2020). "Houston, we have a problem ": Revealing MOOC practitioners' experiences regarding feedback provision to learners facing difficulties. *Computer Applications in Engineering Education*, *1*, 29-4, 769-785. https://doi.org/10.1002/cae.22360

Tsai, Y. S., Whitelock-Wainwright, A., & Gašević, D. (2020). The privacy paradox and its implications for learning analytics. *LAK '20: Proceedings of the Tenth International Conference on Learning Analytics & Knowledge* (230–239). https://doi.org/10.1145/3375462.3375536

Tucker, I., & Goodings, L. (2014). Mediation and digital intensities: Topology,

psychology and social media. *Social Science Information*, *53*(3), 277–292. https://doi.org/10.1177/0539018414525693

van de Oudeweetering, K., & Decuypere, M. (2019). Understanding openness through (in) visible platform boundaries: a topological study on MOOCs as multiplexes of spaces and times. *International Journal of Educational Technology in Higher Education, 16*(28), 1-30. https://doi.org/10.1186/s41239-019-0154-1

van de Oudeweetering, K., & Decuypere, M. (2020). In between hyperboles: Forms and formations in Open Education. *Learning Media and Technology*, *46*(1), 60–77. https://doi.org/10.1080/17439884.2020.1809451

van de Oudeweetering, K., & Decuypere, M. (2022). Navigating European education in times of crisis? An analysis of socio-technological architectures and user interfaces of online learning initiatives. *European Educational Research Journal*, *21*(6), 922–945. https://doi.org/10.1177/14749041211059008

van de Oudeweetering, K., & Decuypere, M. (2023). Interrogating "the nation" in European online education: Topological forms and movements. *European Educational Research Journal.* Advance Online Publication. https://10.1177/14749041221148234

van Reekum, R. (2019). Patrols, records and pictures: Demonstrations of Europe in the midst of migration's crisis. *Environment and Planning D: Society and Space*, *37*(4), 625–643. https://doi.org/10.1177/0263775818792269

Vanden Broeck, P. (2020). The problem of the present: On simultaneity, synchronisation and transnational education projects. *Educational Philosophy and Theory*, *52*(6), 664–675. https://doi.org/10.1080/00131857.2019.1707662

Van Dijck, J., & Poell, T. (2015). Higher education in a networked world: European responses to U.S. MOOCs. *International Journal of Communication, 9,* 2674–2692. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2645629

Veletsianos, G., Collier, A., & Schneider, E. (2015). Digging deeper into learners' experiences in MOOCs: Participation in social networks outside of MOOCs, notetaking and contexts surrounding content consumption. *British Journal of Educational Technology*, *46*(3), 570–587. https://doi.org/10.1111/bjet.12297

Venturini, T. (2012). Building on faults: How to represent controversies with digital methods. *Public Understanding of Science*, *21*(7), 796–812. https://doi.org/10.1177/0963662510387558

Venturini, T., Bounegru, L., Gray, J., & Rogers, R. (2018). A reality check (list) for digital methods. *New media &society, 20*(11), 4195-4217. https://doi.org/10.1177/1461444818769236

Verstockt, M. (1982). *De Genesis van de Vorm*. Standaard Uitgeverij.

Vrasidas, C., & Miliou, O. (2019). *CATALOGUE of Free Digital Learning initiatives for migrant and refugee inclusion*. MOOCs4Inclusion. www.moocs4Inclusion.org

Webb, P. T., Sellar, S., & Gulson, K. N. (2020). Anticipating education: governing habits, memories and policy-futures. *Learning, Media and Technology*, *45*(3), 284–297. https://doi.org/10.1080/17439884.2020.1686015

Weller, M. (2014). *The Battle for Open: How openness won and why it doesn't feel like victory*. Ubiquity Press.

Weller, M., Jordan, K., Devries, I., & Rolfe, V. (2018). Mapping the Open Education Landscape: Citation Network Analysis of Historical Open and Distance Education Research. *Open Praxis*, *10*(2), 109–126. https://doi.org/10.5944/openpraxis.10.2.822

Wiley, J. B. (2015, December 3). *Reflections on Open Education and the Path Forward.* Improving Learning. https://opencontent.org/blog/archives/4082

Williamson, B. (2016). Digital education governance: data visualization, predictive analytics, and 'real-time' policy instruments. *Journal of Education Policy*, *31*(2),

123–141. https://doi.org/10.1080/02680939.2015.1035758

Williamson, B. (2017a). Decoding ClassDojo: psycho-policy, social-emotional learning and persuasive educational technologies. *Learning, Media and Technology*, *42*(4), 440–453. https://doi.org/10.1080/17439884.2017.1278020

Williamson, B. (2017b). Who owns educational theory ? Big data , algorithms and the expert power of education data science. *E–Learning and Digital Media*, *14*(3) 105–122. https://doi.org/10.1177/2042753017731238

Williamson, B. (2018a). Silicon startup schools: technocracy, algorithmic imaginaries and venture philanthropy in corporate education reform. *Critical Studies in Education*, *59*(2), 218–236. https://doi.org/10.1080/17508487.2016.1186710

Williamson, B. (2018b). The hidden architecture of higher education: building a big data infrastructure for the 'smarter university.' *International Journal of Educational Technology in Higher Education*, *15*(12), 1–26. https://doi.org/10.1186/s41239-018-0094-1

Williamson, B. (2021). Meta-edtech. *Learning Media and Technology*, *46*(1), 1–5. https://doi.org/10.1080/17439884.2021.1876089

Williamson, B., Bergviken Rensfeldt, A., Player-Koro, C., & Selwyn, N. (2019). Education recoded: policy mobilities in the international 'learning to code' agenda. *Journal of Education Policy*, *34*(5), 705–725. https://doi.org/10.1080/02680939.2018.1476735

Williamson, B., Eynon, R., & Potter, J. (2020). Pandemic politics, pedagogies and practices: digital technologies and distance education during the coronavirus emergency. *Learning, Media and Technology*, *45*(2), 107–114. https://doi.org/10.1080/17439884.2020.1761641

Winters, N., Eynon, R., Geniets, A., Robson, J., & Kahn, K. (2020). Can we avoid digital structural violence in future learning systems? *Learning, Media and Technology*, *45*(1), 17–30. https://doi.org/10.1080/17439884.2020.1708099

Yildiz, H. S., & Sural, I. (2019). Akadema: Anadolu University MOOCs initiative. *European Journal of Open Education and E-Learning Studies*, *4*(1), 100–112. https://doi.org/10.5281/zenodo.3351396

Yuan, L., & Powell, S. (2013). *MOOCs and Open Education: Implications for Higher Education.* Manchester Metropolitan University's Research Repository. https://e-space.mmu.ac.uk/619735/

Zafras, I., Kostas, A., & Sofos, A. (2020). MOOCs & Participation Inequalities in Distance Education: a Systematic Literature Review 2009-2019. *European Journal of Open Education and E-Learning Studies*, *5*(1), 68–89. https://doi.org/10.46827/ejoe.v5i1.3260

Zaidi, S. B. (2022). Situating Sensitizing Concepts in the Constructivist-Critical Grounded Theory Method. *International Journal of Qualitative Methods*, *21*, 1–6. https://doi.org/10.1177/16094069211061957

Zakharova, I., & Jarke, J. (2022). Educational technologies as matters of care. *Learning, Media and Technology*, *47*(1), 95–108. https://doi.org/10.1080/17439884.2021.2018605

Zhang, J., Gao, M., & Zhang, J. (2021). The learning behaviours of dropouts in MOOCs: A collective attention network perspective. *Computers and Education*, *167*(19), Advance Online Publication. https://doi.org/10.1016/j.compedu.2021.104189