

**Exploring the relationship between student learning space and online  
learning within the context of the COVID 19 pandemic: a  
sociomaterial perspective**

By Jinseon Won (s1005944)

MSc Organizational design & development, Radboud University

Supervisor: Dr. Michel van Berkel

Second inspector: Dr. S. Schembera

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### Abstract

Models and methods to design learning spaces to effectively perform learning activities are still under-theorized and are urgently required by contemporary education. To redeem this literature gap, the current thesis explored how students design their learning spaces within the context of the COVID 19 pandemic and how their learning space designs connect with their online learning activities. This thesis employed sociomaterial perspectives to understand heterogeneous networks implicated in the relationship between learning space and learning. Semi-structured interviews were conducted with eight university students who study in the Netherlands. With collected data, the current thesis performed template analysis to identify and develop themes. The relationships among these themes are illustrated in the conceptual model of the current thesis. The essential findings are that three networks implicated in the relationship between learning space and online learning afford various actors (human and nonhuman things) to actively interact with one another to produce actions such as design and learning activities. That is, students design their learning spaces through minute interactions with their tools, furniture, devices, technologies, and spaces to perform online learning activities within these three networks. The thesis findings contribute to studies on learning space designed for learning by providing profound insights into students learning space designs and their connections with learning activities and experiences. Several practical implications are drawn from the thesis findings to aid people to cope with contemporary education during the pandemic.

*Key words:* learning space, online learning, design activities, sociomateriality, actor-network theory, network

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## Chapter 1. Introduction

Understanding the relationship between learning space and learning is essential in HE (higher education) and organizational studies. Emerging studies claim that learning space should be perceived as dynamic and adaptable, constantly being generated by learning practice. (Fenwick, Edwards, & Sawchuk, 2011; Griffiths, Dickinson, & Fletcher, 2021; Wieszaczewska, 2018). Thus, learning space cannot sustain itself without learning. However, Fenwick et al. (2011) argue that space is not simply a background against in which students perform learning. Namely, the physical location of a classroom does not fully represent the learning space. However, it is "a specific combination of physical landscapes, their social constructs and performances, and emotional ties that influence and shape the worldview of a person" (Wieszaczewska, 2018, p. 168). Due to this dynamic and intricate nature of space, Fenwick et al. (2011) propose that one should prioritize answering how space is being used and designed for learning rather than simply identifying what space is.

As educational technology developed, studies on space designed for learning have expanded to the context of online learning in distance education (De Laat & Dohn, 2019). Distance education refers to an online education that offers a range of online learning activities in which students do not have to be present on campus or school (Castells, 2004). Since the pandemic started, distance education has become more apparent in the educational industry. This is because the educational arrangement during this time forced universities to shift most activities and classes performed on campus to online. The closure of the campus means an individual's room or house would possibly become a learning space. Due to this trend, some scholars have recently started to explore how learning space has adjusted due to the pandemic, and its impacts on online learning. In this regard, emerging studies have noticed that students have been designing their rooms during the pandemic to establish an optimal learning space

for an enhanced learning experience (Griffiths et al., 2021). They urge more studies to explore this case, as an interesting phenomenon emerges from students design activities for their learning spaces (Gourlay, 2020). In order to dive into this case, it is crucial to account for design activities during which students use and take a range of tools to decorate and arrange their learning spaces. Concerning this issue, Goodyear, Carvalho, and Dohn (2014) put forward that "one needs to understand the kinds of connections that can exist between such tools/devices and participants' activities" (p.137). As mentioned earlier, studies on learning space should provide more attention to how space is being used and perhaps also how it is being designed by tools and technologies to promote learning. Therefore, it is logical and effective to implement a theory to investigate into this case.

*Sociomateriality* has received much attention lately as a theory that is known for describing the entanglement of settings, tools, human things, and technologies in the process of everyday learning (Carvalho & Yeoman, 2021; Gourlay, 2020). The theory encompasses social and material aspects. Materials consist of objects or tools, settings/spaces, technologies, whereas social refers to meanings, actions, values, and cultures (Fenwick, 2015). Sociomateriality enables researchers to take a holistic approach to explore heterogeneous networks where human things (such as human intention and cognition) and materials (nonhuman things) constantly negotiate and interact with each other to facilitate learning (Carvalho & Yeoman, 2021). By employing this theory, it is also allowed to interpret the virtual (online) platform as a set of material that is embodied in the physical world (Gourlay, 2021). Therefore, materializing virtual things makes it much easier to observe the interaction between online learning and physical learning space, which are often considered to be incompatible concepts.

Previous research has implemented sociomateriality to explore this study field. However, this is a study field that is not very advanced in some respects. There are still critical research

gaps that should be covered. First, the concepts and theories related to the connection between learning space and learning are still underdeveloped and under-researched. (Goodyear et al., 2014). Consequentially, there is no consistent theoretical framework that can be used for the research. Second, studies on learning space designed for learning during the pandemic are rare yet vital in the literature. Therefore, more studies should be undertaken to redeem this area and adequately explain the mentioned designing phenomenon. A recent calling by Gourlay (2021) also points out that more focus should be given to how students use and design their learning spaces within the context of the pandemic. Third, in the existing literature, it seems that no study has been adequately explored or identified networks inherent in learning space, although these networks are the keys to comprehend the connection between space and learning from sociomaterial perspectives.

### **1.1 Aim of the thesis**

Due to these research gaps, I have employed sociomateriality to conduct inductive qualitative research to redeem areas that are not well advanced in this study field. The objective of this thesis is to contribute to studies on learning space designed for learning by establishing a conceptual model that illustrates the relationship between student learning space and online learning during the COVID-19 pandemic. Hence, the research question is formulated as "How do students design their learning space for their learning activities within the context of dealing with the pandemic?"

To address this research question, the current thesis has explored heterogeneous networks implicated in the relationship between learning space and online learning activities. Sociomaterial perspectives insist that a range of networks can co-exist in a learning space where they are mutually dependent (Fenwick et al., 2011; Turner, 2008). Therefore, this thesis has paid extra attention to describing the features of networks and the connections between



them. For the data collection, eight interviews were conducted with university students who study in the Netherlands. The interview questions were created to understand students' learning experiences under the pandemic situation and their motivations and reasons behind their learning space designs. After that, template analysis was carried out to discover patterns from the interview data. These patterns were then refined as themes that entail profound insights into the thesis topic. As a result of template analysis, this thesis presents a conceptual model that illustrates the relationship between student learning space and learning.

Besides the main objective, it is necessary to take an intensive literature review to gather information from the existing literature as there is no consistent theoretical framework available to support this thesis. Accordingly, I have conducted a literature review to provide sensitizing concepts as a theoretical lens for the data analysis. These concepts clarify the complex research data, which are useful in understanding the themes and the conceptual model presented in this thesis.

## **1.2 Social and management relevance**

Some readers may wonder how this thesis's content is relevant to the management study, and I would like to clarify my stance on this issue before moving on to the main body of the paper. In the current thesis, I consider the university as an organization and observe a particular event (distance education during the pandemic) that occurs within this organization from the management point of view. Management study is a science of analyzing how people interact with others and how they manage and arrange their tasks to reach the organizational goal (Surya, 2011). The current thesis fits into this definition as it presents directions to reduce the organizational hindrance to help members reach their organizational goals. For instance, there are many difficulties in the current distance education under the pandemic situation that disturb student learning and learning performance (Gourlay, 2020; Griffiths et al., 2021). Designing

an adequate learning space to promote learning is also one of them. In this regard, this thesis offers some novel ideas that might be useful for students who are planning to design their learning spaces. Therefore, the current thesis attempt to solve the organizational problem (learning difficulties) can be regarded as the management study.

### **1.3 Upcoming chapters**

The current thesis entails five essential chapters presented in sequential order: literature review, methodology, results, conclusion, and discussion. The literature review chapter will present three topics and sensitizing concepts for each of these topics. The methodology chapter will provide the methodological framework for this thesis, within which the data collection procedure and the data analysis technique are precisely explained. The results chapter will provide definitions and descriptions for emergent themes and the conceptual model developed from the template analysis. The conclusion chapter will offer an overall summary of the thesis, including research goals, methods, and key findings. The discussion chapter will address the current thesis's contributions to the academic literature, the practical recommendations for readers, the research limitations, the future research, and the personal reflection.

## Chapter 2. Literature review

This chapter addresses three essential topics from the literature to enhance our understanding of the relationship between learning and learning space. These topics are online learning, learning space, and actor-network theory.

The first topic is about the notion of online learning. According to sociomaterial literature, learning is way more complicated than simply an outcome of human cognitive processing (Fenwick et al., 2011). More in particular, it is argued that the notion of online learning has to be reconceptualized to include the role and the involvement of materials such as digital devices, tools, and technology in this process (Castañeda & Williamson, 2021; Gourlay, 2021). Furthermore, many studies also emphasize the need for incorporating the social aspect of online learning within this reconceptualization (Goodyear, Carvalho, & Yeoman, 2021; Lu, Yang, & Yu, 2013). Thus, the current thesis looks into the modern definition and perception of online learning and provides information about the social aspect of learning to support this new definition. The second topic addresses the definition, elements, and dimensions of learning space in the light of distance education. To precisely observe the contemporary learning space, emergent studies assert that it is important to revise the concept of learning space as our perception of this space has changed amid the pandemic (Cahapay, 2020). The third topic has to do with one of the essential perspectives of sociomateriality called, *Actor-network theory*. This perspective is known for identifying and understanding heterogeneous networks in learning space by focusing upon the relationship and interaction between space, activity, humans, and nonhumans (Fenwick et al., 2011; MacLeod, Cameron, Ajjawi, Kits, & Tummons, 2019). Thus, the current thesis has explored this perspective to understand the concept of 'network'.

The essential finding of the current literature review is that the existing literature lacks

a consistent theoretical framework to explicitly draw a connection between learning space and learning within the context of the pandemic. Therefore, this chapter provides sensitizing concepts to redeem this gap in the literature. The sensitizing concept is defined as a starting point or a reference that "draw attention to important features of social interaction and provide guidelines for research in specific settings" (Bowen, 2006, p. 14). In this regard, this thesis uses sensitizing concepts as a theoretical lens to establish the foundation of the data analysis. Moreover, the literature review and the data analysis have been carried out simultaneously to develop sensitizing concepts more suitable for understanding the thesis data.

I have explored various fields of educational and organizational studies to add rich content into my literature review while taking sociomateriality as the center of this process. Table 1 indicates the overview of academic journals, books, and articles reviewed for this chapter based on three mentioned topics. I have used google scholar and Radboud university's digital library as search tools to find information related to the current thesis topic. The most prominent search terms that were used in this thesis are summarized as follows: "sociomateriality of learning", "actor-network theory in education", "online learning and learning space during the pandemic", "impacts of learning space on learning", and "learning space design". In the upcoming sections, the mentioned three topics will be discussed along with sensitizing concepts connected to each topic.

**Table 1**

*Overview of selected sources: journals, articles and books*

Topics	Number of sources reviewed	Sources
<b>Online learning</b>	<b>13</b>	Fenwick et al. (2011), Fenwick (2015), Lu et al. (2013), Gourlay (2021), Yeoman and Carvalho (2019), Waltz (2006), Carvalho and Yeoman (2021), Fawns, Aitken, and Jones (2019), Daniel, Schwier, McCalla, and McCalla (2003), Yao, Tsai, and Fang (2015), Wang, Jeng, Chiang, and Huang (2021), Francescato, Mebane, Porcelli, Attanasio, and Pulino (2007), Venter (2019)
<b>Learning space</b>	<b>15</b>	Ellis and Goodyear (2016), Neill and Etheridge (2008), Cahapay (2020), Bird (2021), Thomas (2010), Goodyear et al. (2014), Baum (2018), Brown and Long (2006), Gourlay (2020), Griffiths et al. (2021), Beckers, van der Voordt, and Dewulf (2016), Ahmad, Yahaya, Abdullah, Noh, and Adnan (2015), Orongan et al. (2019), Harrop and Turpin (2013), Barrot, Llenares, and del Rosario (2021)
<b>Actor-network theory</b>	<b>6</b>	Turner (2008), Wieszaczewska (2018), Fenwick et al. (2011), MacLeod et al. (2019), Gherardi and Nicolini (2005), Callon (1984)

**2.1 Online learning**

To properly explore the connection between learning space and learning in distance education, emergent studies propose to reconceptualize online learning from a sociomaterial perspective (Gourlay, 2021; Yeoman & Carvalho, 2019). The way we learn and create

knowledge has rapidly changed over the decades due to the development of technology in education (Yeoman & Carvalho, 2019). In this regard, many studies propose to observe the social and material aspects of learning. Namely, educators and scholars should pay more attention to how materials such as devices and tools are being used during learning and how the development of web conferencing and technology bring changes in social interactions between students (Fenwick et al., 2011; Lu et al., 2013). Thus, it is necessary to revise the concept of online learning in the light of rapid changes in education while taking account of social and material aspects of learning. In this section, the current thesis provides sensitizing concepts that deliver clear and enhanced insights into the modern perception of online learning.

### ***Sensitizing concept: Online learning***

Generally, learning is defined as "the activity or process of gaining knowledge or skill by studying, practicing, being taught, or experiencing something: the activity of someone who learns" (Merriam-Webster, n.d.-b, Definition 1). Linguistically, learning activity is equivalent to learning. In my literature review, no studies have distinguished between these two vocabs. Hence, this thesis also treats these terms as one concept.

Together with this definition, conventional literature solely pays attention to human/individual cognitive processing during learning (Fenwick, 2015). Whereas, sociomaterial perspectives propose that learning should not be simply interpreted as an outcome of individual cognitive processing as materials or nonhuman things can be performative in learning (Waltz, 2006). In this regard, Carvalho and Yeoman (2021) assert that individual interactions and experiences are not the sole product of human memory, but they are also influenced and regulated by materials, physical structures, and culture. Within the sociomaterial perspective, materials are not perceived as tools or instructions to simply aid human cognitive processing, but they are also impactful and performative as humans during

learning activities (Waltz, 2006). Building on this perception, Carvalho and Yeoman (2021) offer a deep dive into connections between materials or nonhuman things and human things in learning. They introduce the idea of 'learning entanglement' to refer that learning is entangled in a set of interactions between humans and nonhumans. The core purpose of their study is to explain that humans and materials are dependent on each other to maintain the entanglement where learning emerges (Carvalho & Yeoman, 2021). Therefore, paying attention to both human and nonhuman things is the key to comprehend the entanglement of learning (Carvalho & Yeoman, 2021; Fenwick, 2015).

As mentioned above, it is most certain that materials matter for understanding the notion of learning; however, the question arises as to whether learning facilitated within online or virtual environments can be materialized as physical learning? The dominant discourse tends to consider online learning and its environment – so-called virtual things are entirely segregated from the physical material world (Fawns et al., 2019). Namely, they are disembodied practices that only happen in the virtual environment. This kind of perception towards online learning is problematic because materials contribute to the existence of such a process (Fawns et al., 2019). Gourlay (2021) pays close attention to the materiality of distance or digital education. He argues that "Engagement is necessarily situated in a particular location, there is no 'escape' from the material surround, whether the device is being used at home, in an airport, or walking down the street" (Gourlay, 2021, p. 60). Although online learning/engagement and its environment seem to be liberated from the confined material world, the reality is that these virtual things can not exist without the digital device (laptop) that runs applications, the object (desk) to put the device, and the space that encompass this object and device. Moreover, virtual things even texts and images are in fact materials from sociomateriality (Gourlay, 2021). Therefore, online learning is embodied in the physical and material world. Consequentially, Gourlay (2021) puts forward that online learning "is always –and entirely– a set of material

and embodied practices" (p.58) ;thus, "is always and entirely sociomaterially-situated" (p.63). Similar to this argument, Fawns et al. (2019) also assert that online learning is an embodied and physical experience; therefore, the success of distance education depends on how students and teachers effectively manage their physical and material environments. From the aforementioned discourses, materializing online learning is possible and allows one to perceive virtual things as physical material. Table 2 shows the above-mentioned definition of online learning.

**Table 2**

*Sensitizing concept: online learning*

<b>Sensitizing concept</b>	<b>Definition</b>
<b>Online learning</b>	Online learning "is always –and entirely– a set of material and embodied practices" (Gourlay, 2021, p. 58); thus, "is always and entirely sociomaterially-situated" (Gourlay, 2021, p. 63).

*Sensitizing concepts: Social capital*

The previous section mainly discussed the material aspect of online learning. However, online learning is also socially situated (Goodyear et al., 2021). In this regard, scholars have studied the correlation between social interactions and online learning (Daniel et al., 2003; Lu et al., 2013). They specifically explore the role and impact of social capital on online learning. Social capital can be defined as social resources created from the network of relationships within a group or community (Yao et al., 2015). There are various resources identified as social capital, but commonly the following are actively discussed in the literature: cooperation, trust,



shared understanding, and social structure (Wang et al., 2021). Instead of precisely looking at these resources, the current thesis presents a general perception of social capital and virtual/online learning community.

Virtual communities are hubs that allow individuals to interact, share knowledge, and create a sense of membership via digital platforms and devices (Yao et al., 2015). These learning communities have become more active during the pandemic due to the growing trend of distance education. However, some scholars express concerns towards such communities as they are considered to be fragile in establishing social capital (Francescato et al., 2007). As people communicate virtually from a far distance, students may experience limitations in having interpersonal and profound interactions with their colleagues (Daniel et al., 2003; Francescato et al., 2007). Thus, virtual communities, to a certain degree, are not well advanced in generating social capital.

Due to this social issue, emerging studies have begun to devise ways to effectively utilize digital platforms or social media to facilitate online learning interactions (Lu et al., 2013). With the development of technologies and social media, many networking tools are available for online learning interactions (Francescato et al., 2007). Employing these tools to interact with others and establish social networks is identified as media-based human interactions. Media-based human interactions build robust social capital by offering access to diverse networks and allowing students to customize their learning activities (Venter, 2019). One advantage of such interactions is that people have much freedom to explore various communication platforms, and choose one that fits to their learning activities (Francescato et al., 2007; Venter, 2019). Venter (2019) is one who have noticed this opportunity, and his findings indicate that "online students move beyond the formal learning environment and integrate various interaction modes and platforms to further their learning" (p.252). He argues

that media-based human interactions enable students to engage with other informal platforms (not formally offered by class) to enhance their learning activities and experiences. In such interactions, the success of learning is dependent upon student's capability to effectively customize and utilize their online learning platforms to gain better access to social capital (Lu et al., 2013; Venter, 2019).

Students' collaborations are highly valuable in media-based human interactions as they enable students to actively exchange information and cooperate with their peers to successfully carry out projects and assignments (Francescato et al., 2007). This kind of group/team working practice generated from such interactions is called collaborative online learning (Daniel et al., 2003). Collaborative learning is essential in virtual communities as this is an effective means to produce and develop relationships between members (Venter, 2019). Students benefit from participating in collaborative learning as it allows students to actively support and help each other to share and co create knowledge (Daniel et al., 2003). Moreover, social capital benefits are closely connected with this type of learning. Collaborative learning amplifies social capital by increasing a sense of membership, trust, cooperation, and support in virtual communities (Lu et al., 2013). Moreover, this social capital makes "members feel committed to their online community and voluntarily contribute time and knowledge to it" (Lu et al., 2013, p. 509). In this regard, Lu et al. (2013) demonstrate in their research that social capital is positively related to student collaborative learning and knowledge sharing in virtual communities.

Based on the debates mentioned, social capital in virtual communities should be perceived as resources embedded in media-based human interactions that can be enhanced through facilitating collaborative learning and adapting online learning platforms (formal and informal) suitable for such interactions. With this sensitizing concept, we gain better insights into social interactions and networks in online learning, and we can use this concept to explore

issues related to social capital. Table 3 shows the definition of the above-mentioned sensitizing concept.

**Table 3**

*Sensitizing concept: social capital*

<b>Sensitizing concept</b>	<b>Definition</b>
<b>Social capital</b>	Resources embedded in media-based human interactions that can be enhanced through facilitating collaborative learning and adapting online learning platforms suitable for such interactions.

## 2.2 Learning space

The notion of learning space in higher education is still underdeveloped, although many studies have claimed that managing a learning space is essential for promoting learning (Ellis & Goodyear, 2016). Connections between learning and learning space have become more complicated as technological advancements enable people to create spaces in both physical and virtual environments (Ellis & Goodyear, 2016). Understanding such a dynamic nature requires more studies into identifying the space in learning. Neill and Etheridge (2008) put forwards that “our understanding of the role of physical space in enabling teaching and learning is limited” (p.47). In COVID 19 period, many scholars have paid primary attention to virtual learning space and environment rather than the physical setting of learning. However, Cahapay (2020) urges more studies to reconceptualize the notion of physical learning space as our understanding of this space has changed amid the pandemic.

In the following sections, the current thesis has developed sensitizing concepts to enhance our understanding of the definition, dimensions and elements of the physical learning space.

***Sensitizing concept: physical learning space***

Space is an abstract and complicated concept. The terms ‘space’ and ‘place’ are often used interchangeably in literature (Ellis & Goodyear, 2016). Although such usage is acceptable in the current literature, Ellis and Goodyear (2016) assert that differentiating between space and place may “be useful in framing different perspectives on learning (p.157). In the current thesis, the term ‘place’ is simply regarded as a physical and geographical area or location wherein people live; whereas space is a more extensive version of this (Ellis & Goodyear, 2016). According to Bird (2021), “space is not merely a static, inert dimension in which “stuff” is placed and organized. Space is known to us by virtue of the social interactions that make it visible” (p. 96). With this definition, space can be understood as a site including both physical and social aspects. Hence, an individual’s room or classroom can be a place as a physical location and a space as a site in which social interactions occur.

There are multiple perceptions towards the physical learning space. According to Thomas (2010), the physical learning space only emerges once it is being used by individuals for learning. He argues that the purpose of physical learning space is to provide affordances that support student learning activities. Affordance refers to the property of an object or an environment that enables individuals to carry out actions (Merriam-Webster, n.d.-a, Definition 1). With this definition, the affordance of learning space is “supports experiences that promote understanding and related learning outcomes” (Ellis & Goodyear, 2016, p. 174). Physical learning space is also perceived as malleable, duplicable, and transferable. Neill and Etheridge (2008) explain that physical spaces can be flexibly adjusted and expanded or reduced based on

how individuals identify and design them. Such malleable spaces can also be duplicated by individuals and transferred within the same place or different places (Thomas, 2010). In layman's terms, a space can produce a particular memory about its design, which helps individuals duplicate this design to create another space that provides similar affordances as the original one (Thomas, 2010). From this point of view, physical spaces can be duplicated and established anywhere where the learning emerges.

Furthermore, some studies have investigated the role of digital devices in the physical learning space. Portable digital devices such as laptops and phones aid students to access online classes from any location (Goodyear et al., 2014). The increasing use of such devices in current education allows students to easily transfer their learning spaces from one place to another (Ellis & Goodyear, 2016; Thomas, 2010). Thus, the learning space is also considered to be a site that supports digital devices being effectively used to perform online learning activities (Thomas, 2010). Ellis and Goodyear (2016) emphasize the role of digital devices as the mediator to connect the physical learning space and social interactions in online learning. Without the support of such devices, it is not possible for individuals to explore or create virtual spaces. Under sociomateriality, it is possible to connect these two conflicting concepts by observing how students interact with digital devices to "access online resources while in a physical learning space" (Ellis & Goodyear, 2016, p. 172). Thus, to understand how online interactions are facilitated in a physical learning space, one has to account for the affordance and usability of such devices for online learning. For a similar reason, Ellis and Goodyear (2016) also stress the importance of recognizing other materials (objects and furniture) that are entangled in the learning space.

In the light of such insights, it is plausible to perceive physical learning space as a malleable, duplicable, and transferable site that affords learning activities performed through

interacting with materials (digital devices, objects, and furniture). This definition is also indicated in Table 4. In this thesis, the term “learning space” was used as an abbreviation for the term “physical learning space”.

**Table 4**

*Sensitizing concept: physical learning space*

<b>Sensitizing concept</b>	<b>Definition</b>
<b>Physical learning space (shortly referred to as learning space)</b>	A malleable, duplicable, and transferable site that affords learning activities performed through interacting with materials (digital devices, objects, and furniture).

*Sensitizing concept: dimensions of learning space*

The previous section provided general insights into the definition and characteristics of physical learning space, whereas this section explores dimensions composing this space. Emerging studies have noticed that students prefer a specific learning space over others based on its physical and social dimensions that they perceive important and helpful for their learning (Beckers et al., 2016; Harrop & Turpin, 2013). These studies demonstrate that it is essential to explore these dimensions to understand how learning space is selected and used. The physical dimension of learning space is concerned with the physical layout of the room, furniture, color, technology, devices, lighting, acoustic, and air quality (Ahmad et al., 2015; Baum, 2018; Orongan et al., 2019). In short, any element that is tangible, visible, and offers physical experiences to individuals is identified as the physical dimension. This dimension is perceived to be crucial in establishing a comfortable, joyful, and secure learning environment, which is

linked to student learning experience and performance (Ahmad et al., 2015; Beckers et al., 2016). In this regard, Orongan et al. (2019) assert that "Physical facilities play an important role in providing quality performance of students" (p. 8). Moreover, most of these physical dimensions can be adjusted, arranged, and enhanced through design activities (Beckers et al., 2016).

On the other hand, the social dimension includes interpersonal communication, collaboration, privacy, and autonomy (Beckers et al., 2016; Harrop & Turpin, 2013). Harrop and Turpin (2013) have precisely looked into this dimension in relation to the students' preferences on their learning spaces. According to their study, students "placed a great deal of importance on spaces for collaboration and interpersonal communication" (p.67). They argue that these social dimensions have to be integrated into learning space design to facilitate social interactions among students (Harrop & Turpin, 2013). Their study also demonstrates that students highly value their privacy during their learning. For instance, some students prefer to study in their own private and quiet space where they feel comfortable and less distracted by surrounding hindrances such as noises and people (Harrop & Turpin, 2013). Autonomy is another social dimension that concerns student degree of freedom to choose where, when, and how to conduct learning activities (Beckers et al., 2016). According to the study of Beckers et al. (2016), a high level of autonomy could determine a student's preference towards learning space.

With references to the literature mentioned above, the current thesis defines dimensions as physical and social dimensions that influence student selection and use for learning space. This definition is indicated in Table 5.

**Table 5**

*Sensitizing concept: dimensions of learning space*

<b>Sensitizing concept</b>	<b>Definition</b>
<b>Dimensions of learning space</b>	Physical and social dimensions that influence student selection and use for learning space.

*Sensitizing concept: design activities*

Design and design activities are essential elements in establishing the learning space. Design is defined as “the way in which something is planned and made” (Cambridge-University-Press, n.d., Definition 5). In this regard, designing or design activity is a process of developing, evaluating, and modifying this design. From my literature review, it appears to be the case that none of the scholars have yet precisely defined design activity or mentioned this term in their studies. By giving close attention to terms they have employed, the current thesis has noticed that the term ‘design activity’ is often replaced by other terms like “arranging”, “planning,” and “reconfiguring” (Baum, 2018; Brown & Long, 2006; Gourlay, 2020).

As put forward by Brown and Long (2006), individuals should be aware of factors such as furniture, foods, drinks, and digital devices when designing their learning spaces. This is because such factors can support and influence learning activities. Moreover, they postulate that the learning space should be designed to fit the kinds of social interactions facilitated by students (Brown & Long, 2006). Baum (2018) observes the impact of learning space design on student social interactions and learning activities. His study demonstrates that the physical arrangement of learning space has a significant impact on the ways students organize and



promote interactions and discussions. Thus, design activities have to be conducted along with careful design thinking on student social interaction and surrounding materials used during learning.

Taken together, design activity can be understood as a process of reconfiguring spaces, relocating furniture, decorating, and mobilizing tools along with careful design thinking to create an optimal physical learning space. Table 6 presents the definition of the above-mentioned sensitizing concept.

**Table 6**

*Sensitizing concept: design activities*

<b>Sensitizing concept</b>	<b>Definition</b>
<b>Design activities</b>	A process of reconfiguring spaces, relocating furniture, decorating, and mobilizing tools along with careful design thinking to create an optimal physical learning space.

*Sensitizing concept: socioeconomic status*

Several scholars have claimed that socioeconomic status may determine the quality of learning space (Barrot et al., 2021; Griffiths et al., 2021); thus, it is a crucial element to be considered when establishing the learning space. The general definition of socioeconomic status is “Any measure which attempts to classify individuals, families, or households in terms of indicators such as occupation, income, and education” (Scott & Marshall, 2009, p. 110). Thus, such a concept includes both social and economic factors. The notion of socioeconomic status has become more relevant and important during the pandemic, “as students lose the

levelling influence of campus learning, where everyone has access to similar spatial resources” (Griffiths et al., 2021, p. 80). Thus, socioeconomic differences among students result in educational inequality where some students have better access to spatial and online resources than others. Barrot et al. (2021) address some major challenges students experienced with distance education during the pandemic. They point out that the lower socioeconomic status is one of the factors that can hinder students from optimizing their learning spaces and also effectively performing learning activities (Barrot et al., 2021). They link such issues to students’ financial resources. Students lacking financial resources may encounter problems with access to the internet, online resources, and sufficient space and appropriate tools to support their learning activities (Barrot et al., 2021).

With references to the insights mentioned above, socioeconomic status can be interpreted as social and economic conditions that are intertwined with an individual’s learning space and learning activities. The table below shows the definition of the sensitizing concept discussed.

**Table 7**

*Sensitizing concept: socioeconomic status*

<b>Sensitizing concept</b>	<b>Definition</b>
<b>Socioeconomic status</b>	Social and economic conditions that are intertwined with an individual’s learning space and learning activities

**2.3 Actor-network theory**

The final destination of understanding the relationship between learning and learning

space through sociomateriality is to identify heterogeneous networks created from minute interactions between materials and humans. Actor-network theory (briefly, ANT) is one of the sociomaterial perspectives that highlights on how things are being enacted and interact with others to maintain networks of relations (Turner, 2008). According to ANT literature, the network is the key driver of making sense of ambiguous and chaotic relations between humans, materials, learning, and space (Fenwick et al., 2011; Wieszaczewska, 2018). In this regard, the current thesis carefully looks into the definition of network discussed by actor-network theory.

### ***Sensitizing concept: network***

ANT has four essential concepts, which are identified as follows: actant, actor, translation, and emergence. Actant refers to any human or nonhuman things involved in a learning activity (MacLeod et al., 2019), such as devices, humans, tools, symbols, furniture, and space. Actant becomes an actor when it exercises force to other entities in the network. (Latour, 1996). The existence and identity of actors heavily rely on the continuity of relations with other actors (Wieszaczewska, 2018). The concept ‘translation’ is brought up here to enable actors to maintain these networks of relations. ANT defines translation as a movement of an actor within connection points established by networks of relations (Gherardi & Nicolini, 2005). Actors translate between these points to exert force, negotiate and assemble with other actors to become enrolled in the network. In this regard, Wieszaczewska (2018) argues that “a network is a set of constantly modified relations in which the actor operates” (p. 172). The concept ‘emergence’ is often used in ANT literature to explain unpredictable and heterogeneous networks in learning activities (MacLeod et al., 2019). Namely, ANT argues that the network becomes prominent (emergent) once the learning activity is conducted (Fenwick et al., 2011; MacLeod et al., 2019).

The network itself can also influence other types of networks and generate powerful

effects on human and nonhuman things (Gherardi & Nicolini, 2005). The network can be expanded, eliminated, and manipulated based on its entanglement with other networks (Fenwick et al., 2011). Moreover, ANT considers all actors (human and nonhuman) as effects of networks because their actions only become meaningful when they are enacted and enrolled within the network (Callon, 1984; Gherardi & Nicolini, 2005; Latour, 1996). Furthermore, ANT literature suggests that one way to understand networks is to identify and observe relationships between different actors (Latour, 1996; Turner, 2008).

From the above-mentioned literature, the current thesis defines the network as a web of relations in which actors constantly interact with one another during learning activities. This definition is also presented in Table 8.

**Table 8**

*Sensitizing concept: network*

<b>Sensitizing concept</b>	<b>Definition</b>
<b>Network</b>	A web of relations in which actors constantly interact with one another during learning activities.

### **Chapter 3. Methodology**

This chapter addresses the information about the research methodology. The first section provides information about the research method and design. The second section shortly mentions the profile of participants. The third section discusses the data collection procedure. The fourth section offers information about the data analysis technique, namely, template analysis and its epistemological position. The fifth section precisely explains the coding procedure. The sixth section describes how the current thesis secures and enhances four qualities (credibility, transferability, dependability, and confirmability). Lastly, this chapter ends with addressing important research ethics for this thesis.

#### **3.1 Research method and design**

The current thesis has employed an inductive qualitative method to answer the research question. The qualitative method is useful in understanding the organization's social phenomena that emerge within a particular context (Myers, 2013). Also, this method is effective "for exploratory research, when the particular topic is new and there is not much previously published research on that topic"(Myers, 2013, p. 9). Thus, this method was employed in this thesis to explore the social phenomena of students designing their learning spaces within the context of dealing with the pandemic. Since there was not much previous research conducted on this topic, the qualitative method was especially required for this exploratory thesis. As the research method gears towards exploring this phenomenon, an inductive approach has been applied to support this method (Myers, 2013). In this regard, I have started with observing and analyzing empirical data to find patterns that serve as the foundation for building a conceptual model. Due to this approach, there was an iterative process between identifying sensitizing concepts in the literature review and developing themes and a template in the data analysis. The entire research strategy and design were built upon this

inductive qualitative method. These relationships are further elaborated in the following sections.

### **3.2 Participant selection**

Participants of this research were eight students from Dutch universities with diverse educational statuses ranging from first-year students to second, third, and master students. These participants were selected by contacting individuals who reacted to my Facebook post and asking students I have personal connections with. All participants live in student accommodations where they have their own single room. Some participants share the common facilities with other residents, whereas one participant lives in a studio where all facilities are equipped in a single room. Despite the slightly different setting, participants, in common, have been conducting most online learning activities in their room(s).

### **3.3 Data collection procedure**

In this qualitative research, I have conducted semi-structured interviews with open questions to allow participants to fully express their thoughts and experiences regarding the thesis topic. Eight interviews have been carried out along with five major questions and different types of follow-up questions. These questions were designed based on topics discussed in the literature review (see Appendix A).

One practice interview was conducted before actual research interviews to examine the clarity of interview questionnaires and the interview procedure. I evaluated the practice interview by asking the interviewee whether the interview questions were designed in understandable ways and whether they reflected the thesis topic. After the practice interview, I found out that previous interviewee had difficulties understanding the thesis topic in general, which did not lead to topic-related discussions. Based on this feedback, I adjusted interview questions to be more related to the thesis topic and provided more precise information about

the thesis's aim and content before the interview.

The data collection procedure can be divided into three sections: before, during, and after the interview. Before the interview, I sent questionnaires with the thesis description to participants two days in advance to give them sufficient time to review the topic and prepare for the interview. During the interview, I have used Zoom recording to record the interview. Once the interview was conducted, the raw audio recording was transcribed using an application called Otter.ai (Liang & Fu, 2021). At last, the interview transcript was uploaded in a data analysis software called NVivo (QSR-International, 2021) for the coding.

### **3.4 Data analysis technique**

Template analysis has been employed as the data analysis technique for this thesis. The flexibility is the biggest advantage of template analysis, among other analysis techniques. It allows researchers to modify and adapt style and format flexibly to establish tailor-made data analysis (Symon & Cassell, 2012). This aspect was especially critical for the current thesis. This is because I wanted to interpret the data wholly without strict guidelines and principles, hindering the explorative nature of the current thesis. Due to this flexibility, I have enjoyed many benefits during the coding procedure. For instance, it was much easier to identify diverse themes and create a robust template as I was allowed to use the initial template as the guidance for later theme developments (Symon & Cassell, 2012). Also, I was allowed to develop parallel coding and an integrative theme to minimize issues of overlapping data (Symon & Cassell, 2012). Thus, template analysis was the most suitable technique that fits the current research method and design.

When conducting template analysis, one must implement an epistemological position (Symon & Cassell, 2012). The current thesis has taken the contextual constructivist, which "assumes that there are always multiple interpretations to be made of any phenomenon and that

these depend upon the position of the researcher and the specific social context of the research" (Brooks, McCluskey, Turley, & King, 2015, p. 205). This thesis strongly supports this assumption as it argues that different interpretations can be yielded with different social contexts. For instance, students from a country that is relatively less impacted by COVID 19 than the Netherlands may have completely different perceptions towards their learning spaces (based on the assumption that this country did not go into lockdown). In light of this epistemological stance, the aim of the data analysis was to simply exploring the social phenomenon and the research data, rather than imposing or demonstrating a particular interpretation for them

### **3.5 Coding procedure**

I have followed the template coding procedure that was suggested by King and Brooks (2017). All procedural steps are mentioned in Appendix B. Before coding the interview transcripts, I read through all the interview transcripts to familiarize myself with the collected data set. This allowed me to comprehensively understand the full data set, which helped me define the initial template. The actual coding began with working on the preliminary coding. I have used NVivo to highlight texts and paragraphs that seem to be interesting or relevant. Then I labeled them into certain codes, and similar codes accumulated into a theme. After that, several themes were grouped into a higher-level theme, and this iterative process continued until all relevant codes and themes were fully identified.

After coding the first interview transcript, the initial template was created. This template included themes that were also relevant for other interview data. However, I was highly concerned that this initial template could hinder me from interpreting new data with an open mind, as King and Brooks (2017) mentioned. To avoid this issue, I have critically compared the initial template with other interview transcripts, and if necessary, I have excluded



most themes of an initial template when creating another template. In the final template, all redundant themes were eliminated by assessing the fitness of those themes to the full data set. The final template has functioned as the basis for addressing major themes and identifying relations between them.

### **3.6 Quality in the research**

The current thesis has carefully complied with four universal criteria for qualitative research. Symon and Cassell (2012) identify four assessment criteria as follow: credibility, transferability, dependability, and confirmability. To enhance the credibility of the research, the current thesis conducted persistent observation and member checks (Korstjens & Moser, 2018). The persistent observation has shown in the process of constantly adjusting and modifying the initial template and redeeming emergent themes to reflect the original data and the participants' views correctly. In this regard, I have saved several coding files in NVivo to illustrate the mentioned process. Additionally, the member check was carried out by inviting participants to critically review and provide feedback on the interview transcript and data analysis (codebooks). This strategy allowed me to develop robust themes approved by participants. Transferability of the research was enhanced by adding thick descriptions in this chapter, including a description of participants, research settings, and the context in which the thesis was conducted (Korstjens & Moser, 2018). Especially, the current thesis provided a rich account of the COVID 19 context across this paper to aid future researchers and readers in evaluating the transferability of the research. Lastly, dependability and confirmability were reinforced by creating an audit trail (Korstjens & Moser, 2018). In this thesis, the research diary served as an audit trail to provide the records of theme development, adjustments made by participants' feedback, and reflective ideas. This research diary may be handy to trace back the origin of the theme and understand decisions made during the coding procedure.

### **3.7 Research ethics**

The current thesis attaches great importance to research ethics. With this regard, the current thesis reflected three fundamental aspects: the clarity of the thesis, the participants' privacy, and the transparency of the data collection procedure. The thesis aim, research ethics, and methodology have been clearly informed to participants before the interview to improve the clarity of the study. For the participants' privacy, all personal information provided by participants has been stored in a separate document that will not reveal to anyone outside of this thesis. Furthermore, all participants' real names have been replaced with their initials in this paper (such as *X* participant). For the research transparency, I have enhanced the quality criteria of the research mentioned in the previous section as those criteria were directly related to the transparency of the data collection and analysis procedure.

## Chapter 4. Results

This chapter presents the results of the template analysis to answer the main research question: "*How do students design their learning space for their learning activities within the context of dealing with the pandemic?*" Figure 1 shows the final template of the current thesis.

The current thesis has come down to six main themes (first-level themes) that were identified during the coding procedure. Four themes are related to the aspects of physical learning space. One theme is about the environmental constraints that reside in the learning space. There is also an integrative theme that concerns the context of online learning. An account of the interpretations of the template was structured around these main themes with employing examples extracted from interview transcripts. Some of these illustrative examples were minorly adjusted to reinforce the sentence structure. Also, all participants' names have changed (such as *X* participant) to protect their confidentiality. There are three levels within this template, which are presented as follows: first-level theme, second-level theme, and third-level theme. The current thesis considers the main theme as the first-level theme. Furthermore, sensitizing concepts developed from the literature review were applied in this chapter to create richer interpretations of emergent themes.

Each account or paragraph ends with a table that offers short descriptions of the main and sub-themes. Moreover, it includes sensitizing concepts that are relevant to the theme discussed. The last section presents the conceptual model that draws out the connection between the learning space and online learning during the pandemic, and it also precisely explains the relationship between each theme to underline this model.

**Figure 1**

*Final template of the current thesis*

**1. Aspect – Coziness**

## 1.1. Decorating

1.1.1.1. Creating aesthetics

1.1.1.2. Sentimental value

## 1.2. Keep it bright and warm

## 1.3. Prevent distractions

**2. Aspect – Multi-functional**

## 2.1. Various functions of the room

## 2.2. Versatile tools

**3. Aspect – Openness**

## 3.1. Access to the window

3.1.1.1. Connection with the outside world

3.1.1.2. Ventilation

## 3.2. Secure empty space

3.2.1.1. Temporal rearrangement

**4. Aspect – Reachable**

## 4.1. Easily accessible

## 4.2. Objects on or near to the desk

## 4.3. Reminder

## 4.4. Smooth task transition

**5. Environmental constraint**

## 5.1. Financial status

## 5.2. Neighborhood

## 5.3. Small room

5.3.1.1. More space

5.3.1.2. Multiple rooms

## 5.4. Temporary rental contract

*(Continued)*

**6. Integrative theme – the context of online learning**

6.1. Active informal communication

6.2. Flexible learning schedule

6.3. Learning difficulties

6.3.1.1. Difficulties socializing

6.3.1.2. Not being productive and motivated

6.3.1.3. Poor quality education

6.4. Online learning activities

6.4.1.1. Collaborative learning

6.4.1.2. Individual learning

6.4.1.3. Various learning platforms

6.5. Study at the desk

6.5.1.1. Focus better

6.5.1.2. Maintain the professionalism

#### 4.1 Aspect – *Coziness*

Coziness was one of the aspects of the physical learning space that has manifested in most participants' rooms. Aspects here refer to physical and social dimensions of learning space that include the physical layout and design of the room, the arrangement of materials, lighting, noise, as well as social and psychological factors such as comfortableness, social relationships with materials, and individuals' commitments towards their learning spaces. Due to the pandemic, students were forced to spend most of their time in their rooms. Interestingly, such a situation made students committed to their rooms. In this regard, some participants have identified their rooms as a comfort zone, wherein they feel comfortable and secure. For example, *H* participant states, "I'm kind of trying to make my room at least bit more cozy or like comfortable or convenient to use".

In order to create and reinforce this aspect, participants have decorated their learning spaces (rooms) by allocating various accessories, pictures, and furniture. Tidying the room was also considered to be a part of decorating. Through such activities, participants created aesthetics so that their learning spaces appeared colorful, artistic, and pleasing. The primary reason behind this action was that such colorful and pleasing environments have helped students better cope with online learning activities. In this regard, *L* participant argued, "it makes me be able to manage all the online classes much better than if I was in an ugly, messy room".

Another intriguing finding was that some items or objects as parts of the decoration possess a sentimental value that produces social bonds with individuals. Plants and memorable items especially have conveyed this value. By looking at these memorable items such as pictures and accessories associated with a specific event or a particular person, *HO* participant was reminded of "the good old days". Moreover, plants and scenery photos provided "the idea of being in a bigger room and being more free and more open ... the idea of not being stuck in

a very, very small room" cited by *G* participant. Thus, items that possess this sentimental value have supported students to stand against loneliness and negative feelings during the pandemic.

Keeping the learning space bright and warm was also an essential element of coziness. As *D* participant argued, "Natural light is the most important thing, I felt more productive ... it's really important for me to keep going bright, because like dark room makes me really distracted and depressed". Most participants were aware that some external conditions in their learning space could potentially disturb learning activities and the coziness of the learning space. These conditions were broadly discussed as direct sunlight, bad smell, and uncomfortable setting. Some participants have tried to eliminate or reduce these conditions to prevent learning distractions. For instance, *H* participant has mentioned that "I'm really kind of sensitive to smells too, along with lighting so I tend to put a lot of diffusers... like perfume like body spray...on my table or at least close to me". Additionally, some participants have bought an extra monitor and a laptop stand to reduce the neck pain caused by constantly looking down on the laptop. Participants have satisfied with their items as they feel more productive and comfortable during their learning activities. The themes discussed in this section, together with the related concepts from the literature review are summarized in Table 9.

**Table 9**

*Theme description: Aspect - Coziness*

Name	Description
<b>Aspect - Coziness</b>	The room is deemed as a comfort zone. Students feel comfortable and secure in their rooms.
<ul style="list-style-type: none"> <li>▪ Decorating</li> </ul>	Students decorate their rooms with various accessories, pictures, and furniture to create an artistic and pleasing vibe.
<ul style="list-style-type: none"> <li>- Creating aesthetics</li> </ul>	Decorating the room to be seen as colorful, artistic, and beautiful.
<ul style="list-style-type: none"> <li>- Sentimental value</li> </ul>	Valuable objects that are socially, psychologically, and emotionally connected with an individual's memories and feelings.
<ul style="list-style-type: none"> <li>▪ Keep it bright and warm</li> </ul>	Brightening the room for learning activities and other activities.
<ul style="list-style-type: none"> <li>▪ Prevent distractions</li> </ul>	Any conditions in rooms that bother individuals should be eliminated or reduced.
Sensitizing concepts: physical learning space, design activities, dimensions of learning space	

#### 4.2 Aspect – *Multi-functional*

All participants have mentioned that the time they spent in their rooms has dramatically increased after the pandemic/lockdown, which made them carry most daily activities in their rooms. *H* participant describes his situation during the pandemic as, "I'm literally stuck in my room. So basically, my whole daily routine starts at room and ends at room". Consequently, participants have attached various functions to their rooms to cover their daily routine during the lockdown. The room being *multi-functional* was also an important aspect of learning space because it was necessary to design a room in ways a range of activities could be effectively performed. It is definite that participants' room has been functioning as a learning space during the pandemic - "I'm mostly stuck at home studying watching lectures and taking exams. And I spent almost full week at home and not really going outside" – quoted by *HO* participant.

Nevertheless, there are so many more things to do for a living besides learning. For example, *L* participant explicitly explained her daily routine in her room: "I'm always here in my room. And I use it to sleep to cook, to take a shower ... to work, to read .... to listen to



music, to do yoga and workout". The rest of the participants have also shared similar experiences of using their rooms for various activities. For this reason, most participants have divided their room into several spaces, and allocate different functions to them. Hence, to perform learning within this disorderly multi-functional setting, it was up to participants to bring balance between a range of activities by organizing their rooms. As the room was multi-functional, tools and furniture also have been used for various purposes. To underline this finding, *H* participant argued that "every single thing in my room kind of has a really various purpose. They're not just yoga mat sometimes used as bad or... I still put some things on there".

The essential point is that participants do not only use their rooms for learning but for various purposes. Therefore, their learning space has been established in ways that learning and other activities can be carried out harmoniously. The themes mentioned in this section, together with the related concepts from the literature review, are summarized in Table 10.

**Table 10**

*Theme description: Aspect – Multifunctional*

Name	Description
<b>Aspect - Multi-functional</b>	The room has many functions to almost cover the daily life of students.
<ul style="list-style-type: none"> <li>▪ Various functions of the room</li> </ul>	A single room entails a range of functions such as eating, exercising, sleeping, and studying.
<ul style="list-style-type: none"> <li>▪ Versatile tools</li> </ul>	Tools that can be used for various purposes.
Sensitizing concept: physical learning space, design activities, dimensions of learning space	

### 4.3 Aspect – Openness

This theme captured participants' perceptions towards the openness of the learning space. Through multiple interviews, openness was defined as the state of being open, free, fresh from constricted reality. Participants prefer to learn or study in a more open space wherein they do not feel like they are being trapped: "I would like to have a more wider space when studying... space that I don't feel like I'm stuck" stated by *HO* participant.

The room with openness appears to be larger and has relatively more spaces to be used. Participants identified two strategies to develop this aspect in the learning space. Locating the bed or desk against the window was one of these strategies. *D* participant has moved her desk in a way that she could have more access to the window. She explained that she had a feeling that she had lost connection with the world and people during the pandemic. She states, "I noticed that I lose connection with the outside world somehow ... I lose sense of reality". *M* participant also shared similar thoughts about losing connection with society, and he thought it was necessary to allocate the desk close to the window for the openness of the room. Both participants believe that this design would help them concentrate better on learning as they feel a strong sense of reality. Another benefit of this design was that participants could quickly open the window and pull curtains to ventilate their learning spaces. In this regard, *G* participant explained that the learning space "looks less cluttered, ... and more open".

The second strategy was by securing spaces as much as possible. Participants have either simply reserved an empty space for the openness of the room or temporarily used this space for activities. *MI* and *N* participants have precisely explained about such designing activity. *MI* participant used the term "spacious space" to describe the extra space she has secured for the openness. *N* participant has also used this space for a similar reason. He pushed every piece of furniture and stuff to the wall so that he could have a space in the middle of the room: "in the old design of the room I did not really benefit from the space ... but now I can actually use this small table in the middle. So whenever I want to eat ... I just push my chair to my desk ... I go sit on the sofa, which is also facing my desktop. And I just play something and eat on the little table".

The abovementioned means were deemed to be effective by participants for enhancing the openness of the learning space. As well, openness was essential for designing a learning space as participants argued that such an open learning space would help them be calm,

productive, and better concentrate during learning. Table 11 presents the descriptions of the mentioned themes and relevant sensitizing concepts.

**Table 11**

*Theme description: Aspect – Openness*

Name	Description
<b>Aspect - Openness</b>	This aspect concerns the openness of the room. Openness refers to the state of being open, free, fresh from constricted reality. The room with openness appears to be larger and has relatively more spaces to be used.
<ul style="list-style-type: none"> <li>▪ Access to the window</li> </ul>	Locate the bed or desk against the window
<ul style="list-style-type: none"> <li>- Connection with the outside world</li> </ul>	Looking out through the window creates emotional attachments to nature and people outside.
<ul style="list-style-type: none"> <li>- Ventilation</li> </ul>	Open windows and pull curtains to ventilate the room.
<ul style="list-style-type: none"> <li>▪ Secure empty space</li> </ul>	Trying to free up space for the openness of the room.
<ul style="list-style-type: none"> <li>- Temporal rearrangement</li> </ul>	Using the empty space for activities. This process also involves reallocating or adding objects.
Sensitizing concepts: physical learning space, design activities, dimensions of learning space	

#### 4.4 Aspect – *Reachable*

This theme compressed information about another aspect of the learning space called reachable. Most participants have established their learning spaces by allocating furniture and tools near their study desks. *M* participant named such a design feature as 'reachable'. *H* participant was especially keen to design his learning space in ways that he could easily access objects during his learning: "So I tried to kind of put every single material I need for studying on the table so that I don't need to stand up and go grab something". He was not only limited to study-related tools like digital devices or a paper notebook, but he also placed foods, water, lamps, and various kinds of stuff on his desk that he identified as useful for learning. *G* participant has further discussed the positive impacts of this design. She put various kinds of devices on her desks to simultaneously carry out multiple tasks during learning. She argued

that such reachable design increases her focus and efficiency of learning.

Another reason for putting tools on the desk was because they have functioned as reminders to inform upcoming events to participants. In this regard, *H* participant mentioned, "If I really have an important stuff, or like an important upcoming event I need to remember, I write it down somewhere and put it on like every material I use ... so that I don't forget". This reachable design also allowed participants to switch their learning space from one to another in a prompt manner. Participants do not always study on the desk, but they sometimes move to other spaces where they can perform learning activities: "I would just sit on one place usually. But if I'm distracted, of course, I would try to move to like other side of the desk and even sofa" – stated by *HO* participant. Thus, most participants have arranged a sofa or an extra table close to their main study desks, so they can easily switch their learning spaces. The mentioned themes and the related concepts are summarized in Table 12.

**Table 12**

*Theme description: Aspect – Reachable*

Name	Description
<b>Aspect - Reachable</b>	Organizing the room in ways that all necessities are closed to space where learning activities are carried out.
<ul style="list-style-type: none"> <li>▪ Easily accessible</li> </ul>	Reachable design helps students access objects (tools, devices, foods, furniture) quickly while learning.
<ul style="list-style-type: none"> <li>▪ Objects on or near to the desk</li> </ul>	Locating study/non-study-related objects on and near to the desk.
<ul style="list-style-type: none"> <li>▪ Reminder</li> </ul>	Tools nearby learning space reminds tasks or activities that have to be completed. These tools or items sometimes work as a reminder.
<ul style="list-style-type: none"> <li>▪ Smooth task transition</li> </ul>	Transition during which students instantly switch their learning space from one to another without any disturbances.
Sensitizing concepts: physical learning space, design activities, dimensions of learning space	

#### 4.5 Environmental constraint

This theme is about physical and social environmental factors that restrict students from

choosing and designing their own rooms. Unlike the conditions such as direct sunlight and smell discussed in the theme '*Aspect – Coziness*', the environmental constraints were impossible or difficult to be eliminated or prevented in the first place. This is because these constraints were deeply associated with participants' socioeconomic status. The following constraints were appeared to be predominant among participants: financial status, small room, temporary contract, and neighborhood.

For students with almost no income, the financial status of students takes up a huge part when it comes to choosing their apartments or students' accommodations. Therefore, it was challenging for participants to find a perfect living place as there were always limitations with their options. Consequentially, most participants had to choose a small single room that they could afford. Surprisingly, they were generally satisfied with their current rooms, but they expressed some aspects that would have improved if they were financially prosperous. For instance, *HO* participant states, "If I'm financially successful then I would like to have like one room for study only and one room for my bedroom and one living room. Then it will separate every function clearly than right now". She prefers to have multiple rooms for different activities. However, with her financial status, she had to adapt to the one she could afford: "with my financial status, it's hard to separate all the functions as I mentioned before". *M* participant also shared similar ideas about having multiple rooms. He wants to have a room only for learning purposes and another room for entertaining and sleeping. He argued that by separating rooms for different activities, he might focus better and get less distracted. Whereas, some participants simply wanted their rooms to have bigger spaces: "my room is rather small ... I just wish it was a little bit bigger" mentioned by *G* participant

The temporary contract was also deemed to be a constraint, which limited participants design activities. *H* participant has concretely explained about this issue: " it's really like temporary... if I move to a new room next year, the new room won't be temporary one ... So

maybe I'll kind of finally start to decorate my room more since it'll actually be my room". Hence, this kind of constraint set limits on participants' willingness to design their room. Neighborhood was another constraint that was developed through participants' interpersonal relations with their neighbors or flatmates. Some participants were planning to move out as their friends/flatmates wanted to move out: "I am already looking for a place to be next year because all my friends who live here want to move and I wouldn't want to stay here alone" cited by *L* participant. On the contrary, *MI* participant wanted to keep staying in her current place despite some complaints because she was very satisfied with her current flatmates. Establishing strong bonds with neighbors could potentially disturb individuals leaving and staying in their current rooms at their wills. The mentioned themes and the related concepts are summarized in Table 13.

**Table 13**

*Theme description: Environmental constraint*

Name	Description
<b>Environmental constraint</b>	Physical and social environmental factors that restrict students from choosing and designing their own rooms.
<ul style="list-style-type: none"> <li>▪ Financial status</li> </ul>	Students live in places that match their financial status.
<ul style="list-style-type: none"> <li>▪ Neighborhood</li> </ul>	How well students get along with their neighbours/flatmates determines the length of stay.
<ul style="list-style-type: none"> <li>▪ Small room</li> </ul>	Small confined room with limited designing opportunities.
<ul style="list-style-type: none"> <li>- More space</li> </ul>	Demands to have more spaces.
<ul style="list-style-type: none"> <li>- Multiple rooms</li> </ul>	Demands to have multiple rooms for different purposes/functions.
<ul style="list-style-type: none"> <li>▪ Temporary rental contract</li> </ul>	Renting a room for a short period.
Sensitizing concepts: socioeconomic status, physical learning space, design activities	

**4.6 Integrative theme: the context of online learning**

This integrative theme pervades most data, passing through all mentioned aspect themes. This theme encapsulated distinct characteristics or features of online learning during the pandemic. The first unique feature of online learning was that collaborative learning was

actively promoted among students. Participants, in common, identified collaborative learning or team learning activities as exchanging ideas through online discussion, cooperating for projects, asking questions, and solving problems together. *HO* participant has noticed that online discussion and interaction have dramatically increased during the pandemic: "I really never used discussion board before. But now, we used to post our questions and discuss about it with our classmates". Online collaborative learning has developed along with various learning platforms to enhance the effectiveness and efficiency of online interaction. In this regard, *MI* participant mentioned that, "with regarding to the group projects ... you have like Google Docs, and you have teams, you have all kind of like the online application that allows multiple people to work on a document at once". Besides collaborative learning, individual learning has also changed during the pandemic. Individual learning activities included watching lectures, reading, working on individual assignments, and making summaries. The distinct feature of individual learning was that participants were allowed to rewatch or record lectures more frequently compared to pre- COVID, and they were positive about this change: "part of me appreciated these changes because having lectures online ... gave me the possibility to record them, to store them" stated by *G* participant. In this regard, participants claimed that they have much freedom and flexibility to adjust their learning schedules based on their daily routine.

Another essential finding was that many informal communications were generated during participants' online interactions. Participants used online communication platforms such as WhatsApp to create a casual/informal community with their colleagues, one that was not under the supervision of teachers or professors. Informal communication was deemed to be useful in creating a mutual understanding and relationship among students as participants "try to get to know each other better" through this communication. This type of communication was also helpful in facilitating collaborative learning as participants were able to create multiple

informal channels/communities easily and use them for cooperating with their colleagues. In this regard, *G* participant explained that "for example, if we have team meetings, we would just have ... a channel just for meeting our students .... And create separate meetings in the same channel, if we were working with different things". Hence, active collaborative learning and online platforms that stimulate informal communication created and enhanced social capital during participants' online interactions. Moreover, the social capital of distance education was seemed to be task-oriented in which participants built mutual trust, understanding, and good relations with their peers to accelerate collaborative learning.

Another unique character of online learning during the pandemic was that all participants had identified their rooms as learning spaces where they mostly carried learning activities at their study desks. Although there were many spaces in participants' rooms that could be used for learning, they particularly designed their learning space around their study desks. *D* participant provided a detailed explanation about why she studies at the desk: "when I'm in bed, I cannot focus. And when you're sitting in front of the desk ... feels productive ... That's why I attend all my lectures only in front of my desk". Additionally, *D* participant also highlighted that it is impolite and unprofessional to attend online classes on the bed as their appearances appear on the computer screen. Thus, she mostly attended online meetings and lectures at her desk to maintain professionalism during learning. In short, the reasons for learning at the desk are to enhance concentration and maintain professionalism.

Lastly, participants shared some learning difficulties that they have experienced during the pandemic. The following topics were repeatably mentioned by participants: difficulties socializing, not being productive and motivated, and poor-quality education. Participants have experienced difficulties socializing with their peers. Although various platforms allowed participants to easily and freely interact with others, participants always felt limitations in generating more profound and abiding relationships with their peers. Participants also



encountered difficulties regarding not being productive and motivated. For instance, *N* participant has noticed that he "worked way too much" that he became less productive but exhausted. He explained that "But when you're doing everything from the same place, and you don't really get the change, it's a bit of an overkill. And it makes you think sometimes that you probably have worked way too much when it's probably the same load of work". As he had to quarantine himself in his room during the pandemic, he had to use his room as a learning space which was used to be his only place for resting. Thus, he was exhausted by constantly using his room as a learning space.

Poor quality education was another factor that hindered students from effectively conducting learning activities. Some participants claimed that some courses did not use the right platforms and proper study materials that fit students' learning circumstances. In this regard, *H* participant states, "many people are kind of complaining about the quality of live lectures and tutorials during COVID crisis, the materials they provide ... kind of either outdated or like not holding enough information we need for studying".

The essential finding was that the context of online learning has changed over the pandemic, and participants experienced both difficulties and advantages of distance education. Moreover, these experiences and changes have influenced the ways they designed their learning spaces. Table 14 summarizes the mentioned themes and the related concepts from the literature review.

All six first-level themes have been concretely explained in this chapter. As a result of this template analysis, the current thesis has discovered connections between these themes. Thus, the conceptual model is provided to illustrate these connections in the next section.

**Table 14**

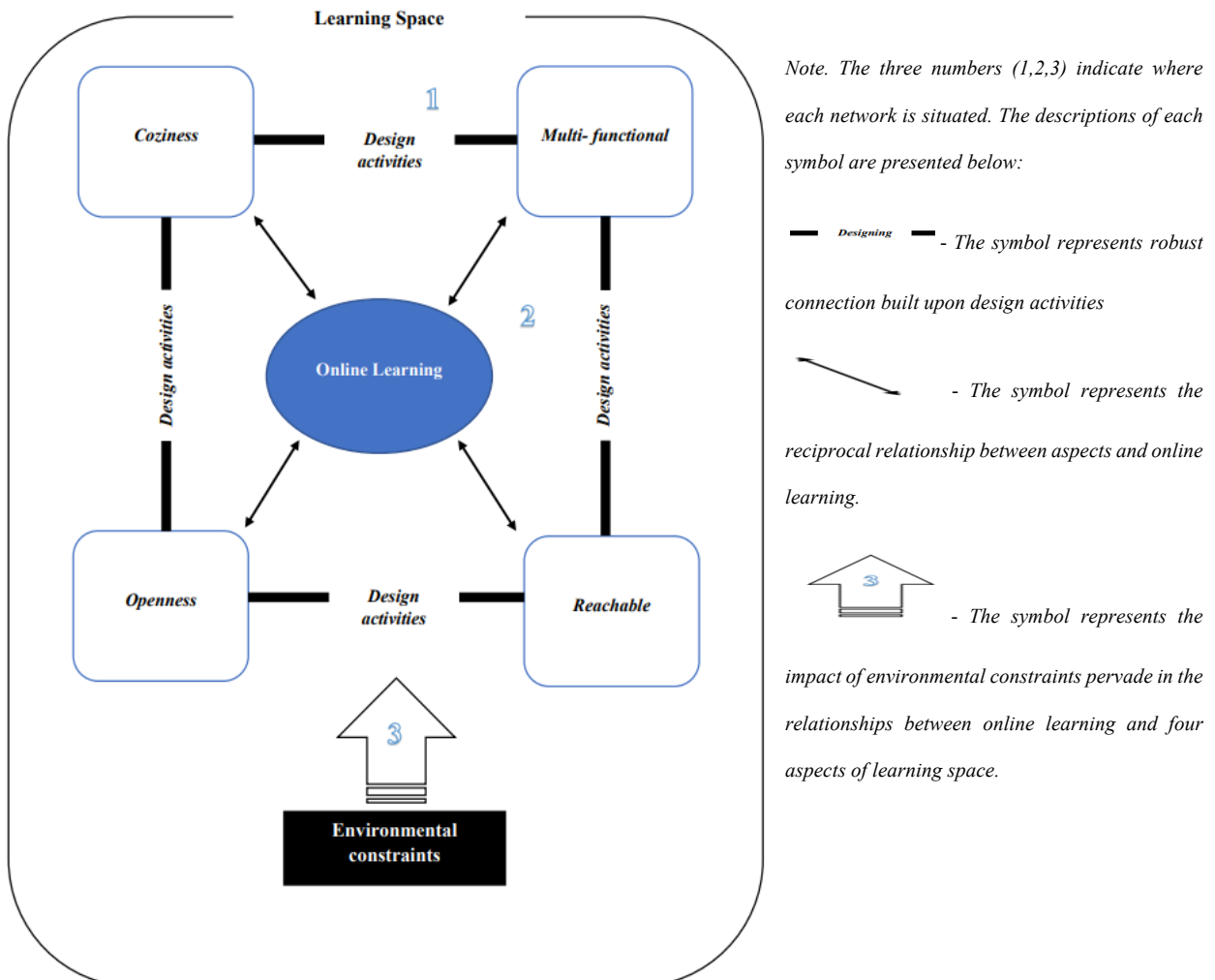
*Theme description: Integrative theme – context of online learning*

Name	Description
<b>Integrative theme - the context of online learning</b>	This theme permeates all 'aspect' themes. Distinct characteristics or features of online learning during the pandemic.
<ul style="list-style-type: none"> <li>▪ Active informal communication</li> </ul>	Causal form of learning communication in which students organize meetings, socialize, and communicate through various online communication platforms.
<ul style="list-style-type: none"> <li>▪ Flexible learning schedule</li> </ul>	Students have much freedom and flexibility to adjust their learning schedules based on their daily routine.
<ul style="list-style-type: none"> <li>▪ Learning difficulties</li> </ul>	Difficulties students have experienced with distance education.
<ul style="list-style-type: none"> <li>- Difficulties socializing</li> </ul>	Covid pandemic makes it difficult for people to socialize because they can not see each other in real life (at a physical place).
<ul style="list-style-type: none"> <li>- Not being productive and motivated</li> </ul>	Low level of concentration and motivation due to the lockdown situation during the pandemic.
<ul style="list-style-type: none"> <li>- Poor quality education</li> </ul>	Some courses do not use the right platform and the proper study materials that fit students' learning circumstances.
<ul style="list-style-type: none"> <li>▪ Online learning activities</li> </ul>	Learning activities take place over the internet.
<ul style="list-style-type: none"> <li>- Collaborative learning</li> </ul>	Learning carries out by two or more students - group/team works.
<ul style="list-style-type: none"> <li>- Individual learning</li> </ul>	Learning carries out by the individual.
<ul style="list-style-type: none"> <li>- Various learning platforms</li> </ul>	Students adapt various platforms to perform online learning.
<ul style="list-style-type: none"> <li>▪ Study at the desk</li> </ul>	Desk as the center of learning space.
<ul style="list-style-type: none"> <li>- Focus better</li> </ul>	Studying on the desk increases concentration.
<ul style="list-style-type: none"> <li>- Maintain the professionalism</li> </ul>	Student studies on the desk in order to be seen as a respectful and capable person by other people.
Sensitizing concepts: online learning, social capital	

### 4.7 Conceptual model: Relationship between learning space and online learning

This section presents a conceptual model to illustrate how online learning and learning space are entangled within heterogeneous networks. Figure 2 shows three types of networks that include four aspects of learning space, online learning, design activities, and environmental constraints. Network here does not represent a single entity or factor, but a web of relations between nonhuman, human, social and physical activities, conditions, structure, and space. As shown in Figure 2, Network 1 indicates relationships between four aspects of learning space. Network 2 illustrates relationships between aspects and online learning. Lastly, Network 3 shows the impact of environment constraints pervade in the relationships between aspects and online learning. This model provides the answer to the research question.

**Figure 2** *Conceptual model of the current thesis*



### **Model description from actor-network theory**

The current thesis has employed actor-network theory (ANT) to understand the connections between learning space and online learning identified through template analysis. As explained earlier in the literature review, ANT is a sociomaterial perspective that gears towards exploring entanglements of things in networks and understanding the process of creating these networks (Fenwick et al., 2011). With this perspective, the current thesis has provided descriptions of the three networks mentioned in this section.

Based on ANT, all nonhuman and human things involved in participants' design and learning activities can be considered actors. These actors have the capacity to exert force, negotiate and interact with each other to generate actions such as design and learning activities. ANT treats nonhuman or materials as equally impactful and essential as humans for facilitating these activities (MacLeod et al., 2019). As discussed in the 'Aspect- *Openness*' theme, most participants have located their desks close to the window. This design activity established a relationship between the desk and the window. These materials came together to produce and enhance the openness of the learning space, which was deemed to be helpful for concentration during learning activity. From the 'Aspect – *Coziness*' theme, participants reported that they attached social and emotional meanings to some of their items, such as photos and plants. In other ways, these items also produced a sentimental value that altered participants' moods and perceptions towards their learning spaces. These examples demonstrate that students' intentions and cognitions do not merely carry out design and learning activities, but materials or nonhuman also exert significant forces during these activities. In this regard, ANT insists that "no actor, human or nonhuman, could exist completely on its own, isolated from the networks of relations in which they come to be" (MacLeod et al., 2019, p. 179). Therefore, all of these actors interact and negotiate with one another to secure their meanings within networks;

thus, they are the effects of networks (Fenwick et al., 2011).

The group of actors that form in networks to produce intended or unintended actions refers to an *assemblage* in ANT (Matthews, 2019). With reference to mentioned definition, the current thesis identifies four aspects as assemblages composed of human, nonhuman, technologies, social and physical elements. Network 1 focuses upon nodes that are connected between these four aspects. Four aspects exhibit various designs of learning space during the pandemic. They have their own distinct characteristics in which each of them reflects different social and physical dimensions of learning space. As shown in Figure 2, the four assemblages or aspects are connected through design activities. Design activities facilitate interactions between aspects by relocating tools, decorating, and reconfiguring furniture and spaces. For example, decorating for the coziness of the learning space by putting accessories and items on the desk can also enhance the reachable aspect of the learning space. Another example is that as participants' rooms became multi-functional, they have designed their learning spaces that could also embrace other activities besides learning. However, they would not be able to insert these activities into a small, confined room unless they have some openness in their learning spaces. These examples indicate that all aspects are mutually dependent on each other, and they come together to create and maintain Network 1.

Nevertheless, no single aspect represents the definite design of the learning space as they are constantly changed, adjusted, and even eliminated during learning activities. In other words, aspects are emergent and become functional and meaningful when the learning is conducted. All four aspects gear towards creating an optimal learning space for learning. Based on this finding, the current thesis draws connections between aspects and learning space, which is depicted in Network 2. As shown in Figure 2, learning is situated within four aspects, establishing reciprocal relationships. These reciprocal relationships essentially describe how

online learning and learning space are connected. Aspects of learning space are highly concerned with effectively performing online learning within the context of the pandemic. In other words, participants have mainly designed their rooms to establish an optimal environment for conducting learning activities. Although participants' learning activities were mostly performed online, aspects including the use of digital devices, the position of desks, and various physical materials influenced participants' learning experience and performance. In this regard, they have shared various benefits gained from their learning space design, such as enhanced concentration, more positive feelings, and increased productivity and efficiency. Therefore, learning space is designed to afford aspects that suit student online learning activities, and these activities are constantly influenced by interactions between tools, furniture, humans, and technologies within these aspects. This finding reflects one of the sociomaterial notions that online learning is always material and embodied practice that is sociomaterially situated (Gourlay, 2021). In short, the entanglement of online learning and four aspects creates Network 2.

Network 3 illustrates the impact of environmental constraints that pervade in the relationships between four aspects and online learning. These constraints were identified as financial status, temporary contract, neighborhood, and small room. The common feature was that they could interfere with participants' decisions regarding choosing and designing their rooms. For instance, participants had to choose a single confined room due to their financial status. Thus, participants have complained about their small rooms as they demanded larger rooms or multiple rooms for different activities. They argued that they would have designed their learning spaces differently or even more pleasing and effective for learning if they could afford better places. This implies that their design activities were regulated by their small rooms, preventing participants from having pleasant learning experiences in their learning spaces. Interestingly, participants have coped with these constraints by creating various aspects in their

learning spaces. For example, participants wanted to have a bigger room, so they have enhanced the openness of the room to satisfy their demands. Thus, environmental constraints closely associated with participants' socioeconomic status directly or indirectly affect the relationships between aspects of learning space and online learning. This finding is partly supported by Barrot et al. (2021) study that socioeconomic status could influence ways of facilitating online learning activities and creating a learning space.

To sum up, the current thesis has identified and described three networks (Network 1,2,3) that have manifested in participants' learning spaces. Four aspects and Network 1 indicate various features or designs of learning space and their connections. Network 2 illustrates the relationship between online learning and learning space. Network 3 presents environmental constraints and their impacts that pervade within these relationships. These findings ultimately illustrate the process of students designing their learning spaces for their online learning activities within heterogeneous networks of four aspects, online learning and environmental constraints. These networks emerge and maintain themselves during learning by facilitating interactions between various actors. Actors including human and nonhuman constantly negotiate and interact with one another to produce actions such as design and learning activities. Thus, students design their learning spaces through minute interactions with their tools, furniture, devices, technologies and spaces to perform online learning activities within the context of the pandemic. Altogether, the current thesis has answered the research question: "How do students design their learning space for their learning activities within the context of dealing with the pandemic?". In the next section, the conclusion of this thesis will be discussed.

## Chapter 5. Conclusion

Reexamining and exploring the relationship between student learning space and learning activities in the context of the COVID 19 pandemic becomes more demanded in pedagogical and organizational studies. The current thesis was conducted to explore this field of a topic and carefully analyze how students design their learning spaces and how these spaces connect with their learning activities. The data was collected through interviews with eight participants who currently study in the Netherlands. Since there was no consistent theoretical framework in the existing literature, the current thesis has developed sensitizing concepts to support understanding the empirical data. Sociomateriality and actor-network theory were employed in this thesis to identify heterogeneous networks, and untangle them to analyze the relationships between various elements. Along with template analysis, six themes were developed to portray various aspects of learning space and students' learning experiences under the pandemic. The findings show that students have used their rooms as learning spaces and designed them to effectively perform learning activities during the pandemic. They have shared various learning difficulties and environmental constraints they encountered during this period. However, they put effort into designing an optimal learning space to cope with difficulties and rapid educational arrangements under the pandemic situation. The current thesis has detected patterns formulated in participants learning space designs which were then interpreted as aspects in template analysis. These aspects had unique features and elements, and they were, in common, closely associated with student learning activities.

Based on these themes, a conceptual model was established to provide descriptions for three networks established in the relationship between learning space and online learning. By employing actor-network theory, this thesis argues that learning and design activities are the outcomes of constant interactions and negotiations between humans and materials. Thus, this



model ultimately illustrates the process of designing the learning space for online learning activities through minute interactions between various materials and humans within three networks. With six themes and the conceptual model, the current thesis has provided profound insights into the relationship between learning space and online learning within the context of the pandemic and consequentially answered the research question.

## **Chapter 6. Discussion**

This chapter entails five sections, including theoretical contributions, practical implications, limitations, future research, and personal reflection. First, the findings of the current thesis are compared with the existing literature, and its general and specific contributions are discussed. Then, several practical implications drawn from the thesis findings are provided with recommendations. After that, this chapter critically evaluates the limitations of this thesis and suggests directions to future researchers. This chapter ends with providing a personal reflection on the current thesis project.

### **6.1 Theoretical contributions**

The primary aim of the paper was to contribute to studies on learning spaces designed for learning by observing students' circumstances and experiences under the pandemic. The current thesis has focused upon various issues concerning how students perform in learning in distance education, how they genuinely feel about contemporary educational practices, and how and why they specifically design their learning spaces in such ways. Thus, the current thesis findings overall contribute to enhancing our understanding of the context of COVID 19 in relation to educational practices. The thesis findings also specifically answer the recent call from Gourlay (2021), who recommends future researchers to dig into the relationship between student learning space and learning with the notion of learning being socially and physically situated, namely, the materiality of learning. In his previous research, he explored how teachers and staff have experienced the pandemic (Gourlay, 2020). His findings present rich insights into teachers' perception of contemporary workspaces, their design activities for these spaces, the emotional challenges they encountered, and the technologies and platforms they used for online interactions (Gourlay, 2020). Similarly, Griffiths et al. (2021) conducted a case study to observe also contextual issues but in students' circumstances. Their studies bear resemblances

to the current thesis in many ways. Like the current thesis findings, both studies also emphasize on the materiality of learning and describe the relationship between learning space and learning by observing how participants interact with their tools, furniture, spaces and technologies. The current thesis finding that students cared about maintaining professionalism during learning is also illustrated in Gourlay (2020) study that teachers reconfigured spaces to establish professional workspaces that are reflected in the computer screen. Moreover, the findings that students identified their rooms as learning spaces and carried out learning activities within these spaces are portrayed in Griffiths et al. (2021)'s study that students "reported multi-purposing and adapting their homes to meet their online learning needs" (p. 79). Despite many similarities, these mentioned studies are limited in providing detailed insights to articulate relationships between materials, spaces, and activities; instead, their findings seem to be very multilateral and extensive that one may find difficulty drawing practical insights from them. In the light of this limitation in the existing literature, the current thesis contributes to bringing more explicit findings to the literature by grouping experimental data into three essential factors, including aspects of learning space, learning activities, and environmental constraints. Such findings also answer the calling from Ellis and Goodyear (2016) that more focus should be given to discover factors or mechanisms implicated in the relationship between learning space and learning by "observing what students actually do" (p.181).

Furthermore, aspects identified in this thesis underpin studies emphasizing the importance of physical and social aspects or dimensions of learning space. The current thesis demonstrates that multiple aspects co-exist in students' learning space, and they are mutually dependent within networks and tailor-made for learning activities. This bolsters the findings of Harrop and Turpin (2013), who claim that spaces can have a variety of identities, and these identities have to be compatible to enhance learning experiences. Likewise, Somerville and Collins (2008) argue that students desire to have open, comfortable, and functional learning

environments. These learning preferences are in line with the aspects discussed in this thesis, such as openness, coziness, and reachable. However, the main difference would be that the learning space aspect is considered an extensive version of learning preference, which includes various social and physical elements. Namely, if aspect is a three-dimensional assemblage that exists in student learning space, then the learning preference is simply an idea that remains in individual's cognition. In contrast to the current thesis findings, Beckers et al. (2016) insist that aesthetical aspects of the physical learning space design are deemed less important for students as they prioritize functional aspects of learning space. However, the current thesis argues that creating aesthetics through decorating the space is essential to establish a comfortable, secure, and cozy learning space. One possible reason for these conflicting views may lie in the research context. Beckers et al. (2016) conducted their studies before the pandemic, during which on-campus learning was the mainstream. On the other hand, the current thesis observed cases during the pandemic. It is reasonable to claim that students preferred their learning spaces to have functional aspects rather than aesthetics as they had clear boundaries between workplace and home before COVID 19. Whereas, within the context of the pandemic, students had to constantly fight with loneliness and depression and were forced to multi-purpose their rooms, which tarnished boundaries between workplace and resting place (Griffiths et al., 2021). To overcome these issues, students valued the coziness and aesthetical aspects of the learning space. Hence, the research context is essential in differentiating the current thesis from other on-campus learning studies.

Lastly, this thesis contributes to the literature by presenting a precise conceptual model. There have been various pedogeological models to account for the relationship between learning space and learning (Ellis & Goodyear, 2016). Activity-Centred Analysis and Design, shortly as ACAD is one of the models spotlighted among emergent studies. ACAD illustrates that learning is epistemically, socially, and physically situated. This model helps understand

the relationships between epistemic, social, and physical dimensions, which constitute the learning structure (Goodyear et al., 2021). Despite this significant work, this model does not magnify each dimension, nor does it provide rich explanations about them. Concerning this limitation, the current thesis with the conceptual model focuses upon precisely describing the physical and social dimensions of four aspects, and clearly illustrating how these aspects are entangled with online learning and environmental constraints. In this regard, this conceptual model has clear and precise pictures of heterogeneous networks implicated in the relationship between learning space and learning. In that sense, the model presented in this thesis may be regarded as an important contribution to the literature.

## **6.2 Practical implications**

The insights and findings presented in this thesis can be practical and entertaining to various audiences interested in this topic, such as students, teachers, designers, educational managers, and facility managers. Thus, the current thesis draws several practical implications from the thesis findings and mentions them here.

The main practical contribution is that the thesis findings may facilitate an individual's critical thinking of the use of space and space design. The current thesis demonstrates that learning space is more than a container that actively interacts and produces various aspects with learning activities. In this regard, Thomas (2010) states that critical thinking is a must-have skill required by individuals to survive in a complex environment with multiple identities. As illustrated in this thesis, learning space could have multiple identities that negotiate with one another to maintain their meanings. Four aspects discovered in this thesis are examples of these identities, which contain complicated assemblages of tools, furniture, devices, human and social elements. In this regard, this thesis suggests that instead of simply thinking about where to locate tools, desks, and furniture for the learning space design, students should critically

think about establishing aspects in their learning space that fit their learning activities. However, creating aspects of learning space could be challenging for some students as they are emergent and constantly changed during learning activities. In this case, the current thesis recommends focusing upon findings that were clearly shown to be positive in enhancing learning experiences and activities. For instance, strategically decorating the learning space together with plants, paintings and pictures may increase motivation and avoid negative emotions during learning activities. Besides this example, many other findings in this thesis were regarded as helpful in creating a favorable learning environment. Paying attention to these findings, one may find it easier to establish and promote aspects of learning space. But not limited to this, critical thinking should also entail bringing balance between multiple aspects. As Harrop and Turpin (2013) put forward, incompatible identities in learning space can negatively impact students' learning experience. This thesis does not provide information regarding which aspects are more compatible or incompatible with the other aspects. However, the current thesis suggests that creating an open and flexible learning space is the key to reducing conflicts between different aspects, which is also highlighted by Harrop and Turpin (2013).

The thesis findings may also help teachers and educational managers better understand students' experiences within the context of the pandemic. As shown in this thesis, the pandemic is undoubtedly a cause for many problems in contemporary distance education. This is not only problematic for students and teachers but for educational managers and the university. Therefore, it is necessary for teachers and universities to gain more insights into students' circumstances under the pandemic to adopt effective strategies to cope with difficulties and enhance students' learning experiences. In this regard, the current thesis presents profound insights into difficulties that students encounter during the pandemic. Depression and loneliness caused by limited social interactions with peers and teachers due to the lockdown were commonly mentioned as learning difficulties in this paper. In this regard, Pappas and

Giannakos (2021) propose that lectures and teachers should offer more collaborative sessions such as workgroups, projects, and feedback sessions to enhance interaction among students and between students and teachers. Thus, this thesis recommends that teachers take an active role in designing flexible and interactive classes and making a communication channel where students can easily reach out to ask questions for immediate responses.

Apart from these difficulties, environmental constraints were regarded as difficulties that hindered design and learning activities. As Barrot et al. (2021) put forward, students from low-income families could be burdened by buying digital devices or materials necessary for attending online classes. Consequentially, their learning experiences are relatively adverse than other students with better financial status. Therefore, the current thesis recommends that educational and facility managers and universities to provide financial assistance to those students, for them to have better access to the internet and online materials. Additionally, understanding these constraints may support teachers in selecting and using appropriate study materials that fit students' circumstances, including their learning spaces, socioeconomic status, and learning difficulties. In this regard, this thesis urges teachers to always critically assess their study materials and online platforms used for classes while considering these circumstances.

### **6.3 Limitations**

The current thesis has two main limitations. The first limitation is the homogeneous sampling. Participants were selected based on their location, residential environment, and educational status. The selection bias occurs as the interpretations were made within specific contextual conditions. In this regard, participants' learning space designs and experiences could be manipulated and influenced by their contextual conditions. For instance, unlike these participants, a person who stays with his or her family in a different country and has multiple

rooms, could provide different insights and answers to their learning experiences under the pandemic. Also, the main pitfall of this homogenous sampling is that the thesis findings may not be generalized across different contexts and samples. Despite these limitations, this thesis insists on homogeneous sampling to increase the chances of finding distinct patterns from the data. If the thesis has taken heterogeneous sampling, then there would be too many conditions to be considered, resulting in less explicit patterns drawn from vague and diffuse data set and obscuring the research direction due to various contextual settings. Nevertheless, the current thesis recognizes the limitation of the homogenous sample.

The second limitation is the subjectivity in the data interpretation. As postulated by Symon and Cassell (2012), personal interpretation and engagement with the data are unavoidable in qualitative research, especially during coding procedures within template analysis. Since the thesis topic is very rare in the existing literature, the data analysis and result interpretations in this thesis have limitations in getting enough support from the existing framework, ideas, and theories. Hence, this thesis has employed a template analysis, which “allow researchers to tailor it to suit their own style and stance towards qualitative data analysis” (Symon & Cassell, 2012, p. 447). The current thesis attempted to avoid leaving out essential ideas and codes during the analysis. Even though the template analysis was conducted while reflecting participants’ feedback on this work, there could always be potential misinterpretations of the data. Thus, the current thesis admits that multiple interpretations can be made based on the viewpoint of the researcher, and there is no universal interpretation to this phenomenon.

#### **6.4 Future research**

Driving from the mentioned limitations, recommendations, and requests to future researchers are addressed here. Concerning the limitation of a homogeneous sampling, the



current thesis urges future researchers to conduct more explorative research on the current topic from various contextual settings. Studies on learning space designed for learning within the context of the pandemic are still underdeveloped and require much attention from researchers. In this regard, it would be interesting if the future research could explore and find new aspects of the learning space that are not identified in this thesis. Also, it is strongly recommended for future researchers to consider the presence of socioeconomic status and environment constraints within the relationship between learning space and learning. For instance, students from undeveloped countries may encounter serious problems; not having enough resources provided from schools and governments to access online courses. Thus, future researchers should be aware of socioeconomic differences and various contextual settings, impacting students' perceptions of learning space and learning experiences.

Besides a call for more data and maybe similar approaches to analysis with different contexts or conditions, the current thesis also suggests that future researchers conduct quantitative research. Obviously, it is not appropriate to fully objectify the thesis findings, as their very nature lies within the qualitative analysis. However, if the thesis findings are supported by many other studies, it is possible for future researchers to conduct a quantitative analysis to examine statistical relationships between learning space aspects and learning outcomes based on the operationalization of implied concepts in measurable variables.

Finally, to reduce the subjectivity of the data analysis, future researchers should be proactive in being transparent in data collection and analysis and constantly getting feedback from peers, teachers, and researchers who are experts in this field. Templates and themes being critically evaluated by others would certainly enhance the quality of the research and minimize the subjectivity of the data interpretation. By finalizing this long journey, I express my gratitude and respect to future researchers for their novel passions and wills to explore knowledge and

their courage to dispute universal truth and seek for unrevealed substances yet to be explored.

### **6.5 Personal reflection**

Writing the master thesis during COVID 19 pandemic was a huge challenge for me. I was diagnosed with COVID 19 in early May 2021 while I was on my way of conducting interviews and collecting data. For this reason, my whole thesis project got postponed, and I had no option but to hope for a fast recovery from the infection. My thesis preparation did not go as planned initially, and I went through several major adjustments on my thesis as I experienced difficulties conducting inductive research. Especially, the idea of starting with the data to develop explanations and a conceptual model was very unfamiliar to me. Moreover, I struggled with writing the literature review chapter while keeping inductive reasoning. Namely, I had to address concepts and insights from the literature in ways that merely function as a theoretical lens for the data analysis. However, I gained confidence in conducting inductive research through several feedback sessions/meetings with my main supervisor, Michel van Berkel. I learned to develop sensitizing concepts as a theoretical lens for the data analysis, establishing a clear connection between the literature review chapter and the result chapter. I also got the opportunity to develop my skills in coding interview transcripts and conducting template analysis. In this regard, I learned that developing a template requires constant adjustments, critical thinking, and an open mindset on selecting and identifying patterns from the data. Furthermore, investing a vast amount of time on my master thesis topic, I acquired extensive knowledge in the learning space design and the contemporary education under COVID 19 pandemic. As of right now, I do not see how these lessons and skills I gained through my master thesis project would directly support my future career, but I definitely believe that the time and the effort I spent on this thesis would pay me back one day and would help me pave the way for successful future.

## References

- Ahmad, C. N. C., Yahaya, A., Abdullah, M. F. N. L., Noh, N. M., & Adnan, M. (2015). An instrument to assess physical aspects of classroom environment in Malaysia. *International Journal of Arts & Sciences*, 8(2), 1. Retrieved from [https://www.researchgate.net/publication/295072684\\_AN\\_INSTRUMENT\\_TO\\_ASSESS\\_PHYSICAL\\_ASPECTS\\_OF\\_CLASSROOM\\_ENVIRONMENT\\_IN\\_MALAYSIA](https://www.researchgate.net/publication/295072684_AN_INSTRUMENT_TO_ASSESS_PHYSICAL_ASPECTS_OF_CLASSROOM_ENVIRONMENT_IN_MALAYSIA)
- Barrot, J. S., Llenares, I. I., & del Rosario, L. S. (2021). Students' online learning challenges during the pandemic and how they cope with them: The case of the Philippines. *Education and Information Technologies*, 26(6), 7321-7338. doi:10.1007/s10639-021-10589-x
- Baum, E. J. (2018). Learning space design and classroom behavior. *International Journal of Learning, Teaching and Educational Research*, 17(9), 34-54. doi:<https://doi.org/10.26803/ijlter.17.9.3>
- Beckers, R., van der Voordt, T., & Dewulf, G. (2016). Learning space preferences of higher education students. *Building and Environment*, 104, 243-252. doi:<https://doi.org/10.1016/j.buildenv.2016.05.013>
- Bird, M. (2021). Remaking the Workspace to Boost Social Connection. *MIT Sloan management review*, 63, 95-96.
- Bowen, G. A. (2006). Grounded theory and sensitizing concepts. *International journal of qualitative methods*, 5(3), 12-23. doi:10.1177/160940690600500304
- Brooks, J., McCluskey, S., Turley, E., & King, N. (2015). The utility of template analysis in qualitative psychology research. *Qualitative research in psychology*, 12(2), 202-222. doi:<https://doi.org/10.1080/14780887.2014.955224>

- Brown, M., & Long, P. (2006). Trends in learning space design. *Learning spaces*, 9, 1-9.11.  
Retrieved from <https://www.educause.edu/research-and-publications/books/learning-spaces/chapter-9-trends-learning-space-design>
- Cahapay, M. B. (2020). A Reconceptualization of Learning Space as Schools Reopen amid and after COVID-19 Pandemic. *Asian Journal of Distance Education*, 15(1), 269-276.  
doi:<https://doi.org/10.5281/zenodo.3892969>
- Callon, M. (1984). Some elements of a sociology of translation: domestication of the scallops and the fishermen of St Briec Bay. *The sociological review*, 32(1\_suppl), 196-233.  
doi:10.1111/j.1467-954X.1984.tb00113.x
- Cambridge-University-Press. (n.d.). design. In *Cambridge dictionary*. Retrieved from <https://dictionary.cambridge.org/dictionary/english/design>
- Carvalho, L., & Yeoman, P. (2021). Performativity of materials in learning: The learning-whole in action. *Journal of New Approaches in Educational Research*, 10(1), 28-42.  
doi:<https://doi.org/10.7821/naer.2021.1.627>
- Castañeda, L., & Williamson, B. (2021). Assembling New Toolboxes of Methods and Theories for Innovative Critical Research on Educational Technology. *Journal of New Approaches in Educational Research*, 10(1), 1-14.  
doi:<https://doi.org/10.7821/naer.2021.1.703>
- Castells, M. (2004). *The network society A cross-cultural perspective*. Cheltenham, UK: Edward Elgar.
- Daniel, B., Schwier, R., McCalla, G., & McCalla, G. (2003). Social Capital in Virtual Learning Communities and Distributed Communities of Practice. *Canadian Journal of Learning and Technology / La revue canadienne de l'apprentissage et de la technologie*, 29(3). doi:<https://doi.org/10.21432/T21S4R>
- De Laat, M., & Dohn, N. B. (2019). Is networked learning postdigital education? *Postdigital*

- Science and Education*, 1(1), 17-20. doi:<https://doi.org/10.1007/s42438-019-00034-1>
- Ellis, R. A., & Goodyear, P. (2016). Models of learning space: integrating research on space, place and learning in higher education. *Review of Education*, 4(2), 149-191.  
doi:<https://doi.org/10.1002/rev3.3056>
- Fawns, T., Aitken, G., & Jones, D. (2019). Online learning as embodied, socially meaningful experience. *Postdigital Science and Education*, 1(2), 293-297.  
doi:<https://doi.org/10.1007/s42438-019-00048-9>
- Fenwick, T. (2015). Sociomateriality and learning: A critical approach. In D. Scott & E. Hargreaves (Eds.), *The Sage handbook of learning* (pp. 83-93).  
doi:10.4135/9781473915213.n8
- Fenwick, T., Edwards, R., & Sawchuk, P. (2011). *Emerging approaches to educational research: Tracing the socio-material*(1st ed.). doi:<https://doi-org.ru.idm.oclc.org/10.4324/9780203817582>
- Francescato, D., Mebane, M., Porcelli, R., Attanasio, C., & Pulino, M. (2007). Developing professional skills and social capital through computer supported collaborative learning in university contexts. *International Journal of Human-Computer Studies*, 65(2), 140-152. doi:<https://doi.org/10.1016/j.ijhcs.2006.09.002>
- Gherardi, S., & Nicolini, D. (2005). Actor-networks: ecology and entrepreneurs. *Actor-network theory and organizing*, 285-306. Retrieved from  
[https://www.academia.edu/424192/Actor\\_Networks\\_Ecology\\_and\\_Entrepreneurs?auto=citations&from=cover\\_page](https://www.academia.edu/424192/Actor_Networks_Ecology_and_Entrepreneurs?auto=citations&from=cover_page)
- Goodyear, P., Carvalho, L., & Dohn, N. B. (2014). *Design for networked learning: framing relations between participants' activities and the physical setting*. Paper presented at the Proceedings of the 9th international conference on networked learning.  
<https://www.lancaster.ac.uk/fss/organisations/netlc/past/nlc2014/abstracts/pdf/goodye>

[ar.pdf](#)

- Goodyear, P., Carvalho, L., & Yeoman, P. (2021). Activity-Centred Analysis and Design (ACAD): Core purposes, distinctive qualities and current developments. *Educational Technology Research and Development*, 69(2), 445-464. Retrieved from <https://doi.org/10.1007/s11423-020-09926-7>
- Gourlay, L. (2020). Quarantined, sequestered, closed: theorising academic bodies under Covid-19 lockdown. *Postdigital Science and Education*, 2(3), 791-811.  
doi:<https://doi.org/10.1007/s42438-020-00193-6>
- Gourlay, L. (2021). There Is No 'Virtual Learning': The Materiality of Digital Education. *Journal of New Approaches in Educational Research*, 10(1), 57-66.  
doi:<https://doi.org/10.7821/naer.2021.1.649>
- Griffiths, T.-L., Dickinson, J., & Fletcher, A. (2021). A case study of student learning spaces during the pandemic; a sociomateriality perspective. *Journal of Perspectives in Applied Academic Practice*. Retrieved from <https://jpaap.napier.ac.uk/index.php/JPAAP/article/view/474>
- Harrop, D., & Turpin, B. (2013). A Study Exploring Learners' Informal Learning Space Behaviors, Attitudes, and Preferences. *New Review of Academic Librarianship*, 19(1), 58-77. doi:10.1080/13614533.2013.740961
- King, N., & Brooks, J. (2017). Doing template analysis: A guide to the main components and procedures. *Template analysis for business and management students*, 25-46.  
doi:<https://www.doi.org/10.4135/9781473983304>
- Korstjens, I., & Moser, A. (2018). Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *European Journal of General Practice*, 24(1), 120-124. doi:10.1080/13814788.2017.1375092
- Latour, B. (1996). On actor-network theory: A few clarifications. *Soziale welt*, 369-381.

- Liang, S., & Fu, Y. (2021). *Otter.ai* (Version 2.3.113) [Mobile App]: Google Play Store  
Retrieved from <https://otter.ai/>
- Lu, J., Yang, J., & Yu, C.-S. (2013). Is social capital effective for online learning?  
*Information & Management*, 50(7), 507-522.  
doi:<https://doi.org/10.1016/j.im.2013.07.009>
- MacLeod, A., Cameron, P., Ajjawi, R., Kits, O., & Tummons, J. (2019). Actor-network  
theory and ethnography: Sociomaterial approaches to researching medical education.  
*Perspectives on medical education*, 8(3), 177-186.  
doi:<https://doi.org/10.1007/s40037-019-0513-6>
- Matthews, A. (2019). Design as a Discipline for Postdigital Learning and Teaching:  
Bricolage and Actor-Network Theory. *Postdigital Science and Education*, 1(2), 413-  
426. doi:10.1007/s42438-019-00036-z
- Merriam-Webster. (n.d.-a). Affordance. In *Merriam-Webster.com dictionary*. Retrieved from  
<https://www.merriam-webster.com/dictionary/affordance>
- Merriam-Webster. (n.d.-b). Learning. In *Merriam-Webster.com dictionary*. Retrieved from  
<https://www.merriam-webster.com/dictionary/learning>
- Myers, M. D. (2013). *Qualitative Research in Business & Management* (2 ed.): SAGE  
Publications.
- Neill, S., & Etheridge, R. (2008). Flexible Learning Spaces: The Integration of Pedagogy,  
Physical Design, and Instructional Technology. *Marketing education review*, 18(1),  
47-53. doi:10.1080/10528008.2008.11489024
- Orongan, M. J. Q., Nabua, E. B., Barquilla, M. B., Buan, A. T., Inutan, E. N., & Yuenyong,  
C. (2019). Cognitive attributes, physical and psychosocial aspects of learning  
environment: Its relationship to learners' chemistry achievement. *Journal of Physics:  
Conference Series*, 1340(1), 012068. doi:10.1088/1742-6596/1340/1/012068

- Pappas, I. O., & Giannakos, M. N. (2021). Rethinking Learning Design in IT Education During a Pandemic. *Frontiers in Education*, 6(103). doi:10.3389/feduc.2021.652856
- QSR-International. (2021). NVivo (Version 1.5) [Computer Software]. Retrieved from <https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home>
- Scott, J., & Marshall, G. (2009). socio-economic status. In *A Dictionary of Sociology*. Retrieved from <https://www.oxfordreference.com/view/10.1093/acref/9780199533008.001.0001/acref-9780199533008-e-2198>
- Somerville, M. M., & Collins, L. (2008). Collaborative design: a learner-centered library planning approach. *The Electronic Library*, 26(6), 803-820. doi:<https://doi.org/10.1108/02640470810921592>
- Surya, P. (2011). Educational management, handbook for school of education student. *Yogyakarta State University*. Retrieved from <http://staffnew.uny.ac.id/upload/19811112009121001/pendidikan/output.pdf>
- Symon, G., & Cassell, C. (2012). *Qualitative organizational research: core methods and current challenges*: Sage.
- Thomas, H. (2010). Learning spaces, learning environments and the dis‘placement’ of learning. *British Journal of Educational Technology*, 41(3), 502-511. doi:<https://doi.org/10.1111/j.1467-8535.2009.00974.x>
- Turner, B. S. (2008). *The new Blackwell companion to social theory*. Chichester, UK: Wiley-Blackwell.
- Venter, A. (2019). Social media and social capital in online learning. *South African Journal of Higher Education*, 33(3), 241-257. doi:10.20853/33-3-3105
- Waltz, S. B. (2006). Nonhumans Unbound: Actor-Network Theory and the Reconsideration of "Things" in Educational Foundations. *educational foundations*, 20, 51-68.



Retrieved from <https://eric.ed.gov/?id=EJ794732>

Wang, D.-C., Jeng, Y.-L., Chiang, C.-M., & Huang, Y.-M. (2021). Exploring the cohesion of classroom community from the perspectives of social presence and social capital.

*Journal of Computing in Higher Education*. doi:10.1007/s12528-021-09277-z

Wieszaczewska, A. (2018). The Actor-Network Theory in the Context of Place-Based

Pedagogy. *The Journal of Education, Culture, and Society*, 9(2), 167-178.

doi:<https://doi.org/10.15503/jecs20182.167.178>

Yao, C.-Y., Tsai, C.-C., & Fang, Y.-C. (2015). Understanding social capital, team learning,

members'e-loyalty and knowledge sharing in virtual communities. *Total Quality*

*Management & Business Excellence*, 26(5-6), 619-631.

doi:10.1080/14783363.2013.865918

Yeoman, P., & Carvalho, L. (2019). Moving between material and conceptual structure:

Developing a card-based method to support design for learning. *Design Studies*, 64,

64-89. doi:<https://doi.org/10.1016/j.destud.2019.05.003>

**Appendix A: Interview guide**

Interview Questions	Topics
<i>How does COVID affect your studies? What are some changes?</i>	Online learning, learning space
<i>Could you please precisely explain all the activities involved during your current studies?</i>	Online learning
<i>How do you use your room nowadays? What are some key functions or roles of your room?</i>	Learning space, design activities, dimensions
<i>Why do you design your room in such a way? Why do you place certain objects in a specific location?</i>	Design activities, Network
<i>Are you satisfied with the place you are currently staying in? And why?  Follow-up question: If you could afford to live in a different place, would you rather live there? And why?</i>	Socioeconomic status, learning space

**Appendix B: A summary version of template coding procedures (King & Brooks, 2017)**

1. *Familiarize yourself with the data.*
2. *Start with the preliminary coding.*
3. *Generate the initial template as the basis for the further coding.*
4. *Adjust the existing themes, and eliminate the redundant coding.*
5. *Continue the previous step until the template represents the full data set.*
6. *Use the final template as the basis for analyzing the research findings.*

**Appendix C: Codebook**

Name	Description
<b>Aspect - Coziness</b>	The room is deemed as a comfort zone. Students feel comfortable and secure in their rooms.
<ul style="list-style-type: none"> <li>▪ Decorating</li> </ul>	Students decorate their rooms with various accessories, pictures, and furniture to create an artistic and pleasing vibe.
<ul style="list-style-type: none"> <li>- Creating aesthetics</li> </ul>	Decorating the room to be seen as colorful, artistic, and beautiful.
<ul style="list-style-type: none"> <li>- Sentimental value</li> </ul>	Valuable objects that are socially, psychologically, and emotionally connected with an individual's memories and feelings.
<ul style="list-style-type: none"> <li>▪ Keep it bright and warm</li> </ul>	Brightening the room for learning activities and other activities.
<ul style="list-style-type: none"> <li>▪ Prevent distractions</li> </ul>	Any conditions in rooms that bother individuals should be eliminated or reduced.
<b>Aspect - Multi-functional</b>	The room has many functions to almost cover the daily life of students.
<ul style="list-style-type: none"> <li>▪ Various functions of the room</li> </ul>	A single room entails a range of functions such as eating, exercising, sleeping, and studying.
<ul style="list-style-type: none"> <li>▪ Versatile tools</li> </ul>	Tools that can be used for various purposes.
<b>Aspect - Openness</b>	This aspect concerns the openness of the room. Openness refers to the state of being open, free, fresh from constricted reality. The room with openness appears to be larger and has relatively more spaces to be used.
<ul style="list-style-type: none"> <li>▪ Access to the window</li> </ul>	Locate the bed or desk against the window
<ul style="list-style-type: none"> <li>- Connection with the outside world</li> </ul>	Looking out through the window creates emotional attachments to nature and people outside.
<ul style="list-style-type: none"> <li>- Ventilation</li> </ul>	Open windows and pull curtains to ventilate the room.
<ul style="list-style-type: none"> <li>▪ Secure empty space</li> </ul>	Trying to free up space for the openness of the room.

- Temporal rearrangement	Using the empty space for activities. This process also involves reallocating or adding objects.
<b>Aspect - Reachable</b>	Organizing the room in ways that all necessities are closed to space where learning activities are carried out.
▪ Easily accessible	Reachable design helps students access objects (tools, devices, foods, furniture) quickly while learning.
▪ Objects on or near to the desk	Locating study/non-study-related objects on and near to the desk.
▪ Reminder	Tools nearby learning space reminds tasks or activities that have to be completed. These tools or items sometimes work as a reminder.
▪ Smooth task transition	Transition during which students instantly switch their learning space from one to another without any disturbances.
<b>Environmental constraint</b>	Physical and social environmental factors that restrict students from choosing and designing their own rooms.
▪ Financial status	Students live in places that match their financial status.
▪ Neighborhood	How well students get along with their neighbors/flatmates determines the length of stay.
▪ Small room	Small confined room with limited designing opportunities.
- More space	Demands to have more spaces.
- Multiple rooms	Demands to have multiple rooms for different purposes/functions.
▪ Temporary rental contract	Renting a room for a short period.
<b>Integrative theme - the context of online learning</b>	This theme permeates all 'aspect' themes. Distinct characteristics or features of online learning during the pandemic.
▪ Active informal communication	Causal form of learning communication in which students organize meetings, socialize, and communicate through various online communication platforms.
▪ Flexible learning schedule	Students have much freedom and flexibility to adjust their learning schedules based on their daily routine.
▪ Learning difficulties	Difficulties students have experienced with distance education.
- Difficulties socializing	Covid pandemic makes it difficult for people to socialize because they can not see each other in real life (at a physical place).
- Not being productive and motivated	Low level of concentration and motivation due to the lockdown situation during the pandemic.
- Poor quality education	Some courses do not use the right platform and the proper study materials that fit students' learning circumstances.
▪ Online learning activities	Learning activities take place over the internet.
- Collaborative learning	Learning carries out by two or more students - group/team works.

<ul style="list-style-type: none"> <li>- Individual learning</li> </ul>	<p>Learning carries out by the individual.</p>
<ul style="list-style-type: none"> <li>- Various learning platforms</li> </ul>	<p>Students adapt various platforms to perform online learning.</p>
<ul style="list-style-type: none"> <li>▪ Study at the desk</li> </ul>	<p>Desk as the center of learning space.</p>
<ul style="list-style-type: none"> <li>- Focus better</li> </ul>	<p>Studying on the desk increases concentration.</p>
<ul style="list-style-type: none"> <li>- Maintain the professionalism</li> </ul>	<p>Student studies on the desk in order to be seen as a respectful and capable person by other people.</p>