rijksuniversiteit
groningen
faculteit ruimtelijke
wetenschappen

Making Great Online Spaces

The influence of the online platform of GatherTown on the creativity of the students at the University of Groningen.

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Colophon

Title: Making great online spaces

Subtitle: The influence of GatherTown on the creativity of the students at the University of Groningen

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Date: 09-07-2021

Version: Final

Waarom schrijf ik

Ik schrijf omdat ik wil schrijven
dat ik gelukkig ben.
Op een dag zal het zover zijn
en zal ik schrijven-
met mijn tong tussen het puntje van mijn tanden,
en met rode oren en rode wangen;
ik ben gelukkig.
Als ik daarna ooit nog twijfel
en meen dat ik verdrietig ben of de wanhoop nabij
of zelfs reddeloos verloren,
kan ik altijd opzoeken wat ik werkelijk ben:
gelukkig.

Tellegen, T. (1998).

Why am I writing

I write because I want to write
that I am happy.
One day it will be
and I will write-
with my tongue between the tips of my teeth,
and with red ears and flushed cheeks;
I am happy.
If I ever have any doubts after that
and think I am sad or close to despair
or even irretrievably lost,
can I always look up what I really am:
happy.

Preface

Dear reader. As of now, you're reading the first words of my preface, part of my Master Thesis 'Making great online spaces: The influence of GatherTown on the creativity of the students at the University of Groningen'. The heretofore page contains a poem, as the forthcoming pages will contain hidden treasures of art, written text, in means of a creative harvest. Throughout this paper, the importance of creativity will be stressed. As of a young age, I am fascinated by creative features in the broadest aspect. By looking differently, by performing differently, new doors have opened. Qualities can be magnified, dreams can become reality, and the world can be inspired. Creativity, or the employment off, can also be off cost. As of since, acting or thinking differently is not always welcomed. This uncertainty is the string to balance on, an unexpected undertaking of worth.

On my journey, a few people have been very important. First and foremost, I would like to thank Dr. ir. Terry van Dijk who's profound conversations helped me balance. He helped me in becoming enthusiastic and kept motivating me. More so, and probably even more importantly, besides any academic relevance, he was interested in my well-being. Secondly, I would like to thank Hannah Habekotté and Finn Winkelmann for an endless stock of coffee and moments of thought sharing. Thirdly, I am grateful for the help of all my participants. Without them, I could have not gained the insights I have gathered, and I could have not completed my thesis. In addition, I would like to thank all my friends whose coming pieces of art can be displayed in my thesis. Lastly, many thanks to my friends and family for their countless support, openness and encouragement.

For the present moment, enjoy reading and remember to live creatively.

Joram Wijnstra

Groningen, 9th of July 2021

Abstract

The COVID-19 pandemic has shifted education to the online environment. Within the online environment, new platforms are rising with anew features. One of which is GatherTown. GatherTown provides users with a 2D map and the possibility of one-to-one conversations. Creativity as a resource is staggeringly valuable. However, the result regarding the creativity of moving a creative university course to the online environment of GatherTown is unknown. In this research, creativity is defined as the production of novel and useful ideas. Educational courses and curricula which focus on creativity are increasingly valued in today's society. The following research question has been formulated for this purpose: How do the students of the University of Groningen, following the Spatial Design Atelier course, experience moments of creativity whilst using the online GatherTown platform compared to a physical classroom? Quantitative data is gathered in the form of a questionnaire and qualitative data as semi-structured interviews. Students are divided into two groups, one working fully in the online environment of GatherTown and the other group working hybrid, both in GatherTown and a physical room. The questionnaire proofed that students working hybrid believed that they have experienced more creative processes and statistically created a more creative outcome, based on final grades. Based on the qualitative data, this difference is attributed to: more formality and distraction, poor ability to share ideas, feeling less responsible, missing out on moments of joint leisure. Further research could focus on comparing GatherTown to other online platforms.

Keywords: Creativity, GatherTown, Online, Hybrid, Education, Spatial design, Innovation.

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“Each and every one of us is creative.”

(Kelley & Kelley, 2014)

Groninga – Alexander Rummel Rogerson.

1 Introduction

Creativity is a tremendously valuable resource (Runco et al., 2015). This should, therefore, be supported and stimulated whenever possible. But, what are the best platforms to support creativity? This is a crucial question with implications for education, but also health, technology, planning, and many more. Innovation is one of the most discussed benefits of creativity as being a prerequisite (Rickards et al., 2009). On the 14th of January 2014, United States President Barack Obama famously stated that "the nation that goes all-in on innovation today will own the global economy tomorrow" (Obama, 2014).

Exacting research needs to be conducted to identify the appropriate platform supporting and stimulating creativity, in order to make good decisions regarding assets in the potential for creativity (Runco et al., 2015). As decision-making, is not merely about separate facts, but about stories (van Dijk, 2011). And good decisions require good research (Runco et al., 2015). Logically, educational courses which focus on student creativity are highly valued in today's society (Martz et al., 2017). Curricula which include and stimulate creativity will deliver highly desired graduates (Casner-Lotto & Barrington, 2006; Mao et al., 2020). Therefore, this research will analyse whether the online GatherTown environment will lose of gain creativity, compared to a physical classroom.

1.1 Background

Due to online spaces not being geographically bound, people from all parts of the world are able to use these spaces in order to set up distant meetings. Additionally, human populations are increasingly hyperconnected, due to the rising numbers of internet-related technologies, such as phones and computers (Steffen et al., 2011; Young et al., 2006). Instead of providing classes in a physical environment on a university campus, students are able to attend classes from their homes. Whether it is from the Netherlands, Sweden or China, they can connect without physically being together. However, the collision probability (running into people) of online spaces in classical online lectures is very low, since the whole class is attending the lecture in one online environment. In addition, the COVID-19 virus has greatly affected mankind (Surani & Hamidah, 2020), particularly affecting mobility activities, which include education (Pratama et al., 2020; Putra et al., 2020). This is, although, education is one of the activities that has been strongly advised to continue (Ilyasa et al., 2020). As the virus is mainly transmitted through particles in the air, limiting face-to-face communication and interaction is necessary (Surani & Hamidah, 2020). This limitation has sought to find online alternatives to face-to-face interactions.

One such online platform is GatherTown. GatherTown is an online platform on which individuals can communicate effectively through a combination of a 2D map including the opportunity to video call (GatherTown, 2020a). On this platform, you as an individual can walk around with your character (avatar) and thus decide to start a one-on-one conversation or join a group. At the University of Groningen, this platform is employed due to the effect of the COVID-19 virus. The Spatial Design Atelier Course is a course in which students are asked to think critically, creatively, and collectively in groups of five students (Van Dijk et al., 2018). The first half of the student population had solely online classes in the GatherTown environment. The second half of the student population was following hybrid education, working in GatherTown and additionally they could also attend physical classes to draw, discuss and work.

The development of GatherTown gained momentum due to the uprising of the COVID-19 virus. Is a meeting environment such as GatherTown an effective alternative, and could it be used as an online platform even after the COVID 19 virus? This research tries to identify if an online campus, such as GatherTown can also spark these moments of creativity. This research aims to fill a knowledge gap by exploring the potential link between an online platform in which individuals can use a 2D map and the opportunity to discuss in groups, as well as with other individuals. Further, the conclusions of the report hope to provide a steppingstone to improve student creativity in online education.

1.2 Research problem

For a long time, studies regarding creativity and problem solving have evolved in an individual setting (e.g. Cross & Cross, 1995; Détienne, 2006; Espedido & Searle, 2018; Park et al., 2020; Sternberg & Lubart, 1999). However, according to the study of Park et al., (2020) on creative self-efficacy and innovative team performance, researching creativity is gaining more popularity with a variety of departments such as education, engineering, management & sociology. Also, more studies are focussed on team creativity in physical face-to-face environments, but not many studies have researched team creativity within a virtual team setting (Han et al., 2017). Campuses play an important role in stimulating and facilitating the opportunity to increase moments of innovation and creativity through short random encounters (Curvelo Magdaniel, 2016). In a traditional online environment, these encounters are not possible.

The rise of globalization in combination with the availability of today's information technology and technology communication tools allows the collaboration of individual team members to solve problems as a team project in an online environment whilst sharing various perspectives (Algesheimer et al., 2011; Chen & Chen, 2019; Funk, 2014). Independently of the COVID-19 virus, a general trend of the rapidly growing role of computer-based communication technologies has been observed in society (Samsonovich & Chubarov, 2021). Online education through distance learning has granted learners the opportunity to be connected despite being physically separated (Hartnett, 2016; Saifuddin, 2017). However, online education comes with both benefits and drawbacks (Lee & Martin, 2017). Some of the positive notes are the more flexible working times, the non-commuting, and the unreliability of campus buildings (Bonk & Khoo, 2014). Nonetheless, not all online learning is appreciated, as some learners have clearly expressed their exasperation regarding online class (Hartnett, 2016; Lee, 2014). One of the disadvantages are additional stress and students who are mentally disturbed and unable to follow online learning effectively (Kusnayat et al., 2020). Another disadvantage leading to this research, is the ignorance about the existence of creativity in an online environment (Han et al., 2017), especially in an educational setting.

Therefore, this research investigates whether the online platform GatherTown can, in an educational setting, provide moments of (group) creativity. In addition, the main differences and similarities will be examined with a physical environment. To realize this answer, the following primary research question has been established:

> *How do the students of the University of Groningen, following the Spatial Design Atelier course, experience moments of creativity whilst using the online GatherTown platform compared to a physical classroom?*

To answer this main research question, five secondary research questions are set:

1. How to define creativity?
2. How does creativity show up during face-to-face interactions in previous research?
3. To what extent do students experience moments of creativity in GatherTown?
4. To what extent do students experience moments of creativity in the Physical Design Atelier?
5. How are random encounters on GatherTown valued by students?

1.3 Societal and academic relevance

Regarding the academic relevance, this research builds on the existing literature on team creativity in both an online (e.g. Han et al., 2017) and physical environment (Jansz et al., 2020). Regarding the online environment, this research adds insights about a new online platform, GatherTown. This platform has new features like the possibility for one-on-one conversations which might influence the team creativity processes. Adding to that, this research also compares both the online platform of GatherTown compared

to a physical setting. Moving beyond the educational system, this study is also important to projects working on joint creative processes.

In regard to the societal relevance and impact, this research will stress the importance of physical education in relation to creativity. To the wider society, the differences between online and physical education are important. Globalization, improved technology communication tools, and the COVID-19 pandemic have increasingly moved education to the online environment (Chen & Chen, 2019: Samsonovich & Chubarov, 2021). If educational facilities are aiming not to lose creativity in joint projects, it is crucial to understand why, how, and where creativity is thriving.

1.4 Structure of the thesis

Chapter 2 includes theory, closing off with a conceptual model. The levels of analyses within the theoretical framework are:

1. Physical space/Online space
2. Campuses
3. Individual Creativity
4. Team creativity

Figure 1 is a relational model provided by Jansz et al., (2020) gives a clear insight on what to expect regarding innovation/creativity and other factors. First, the increasing chance of unplanned meetings is a key factor. The existence and importance of this element are well elaborated in section 2.1. The increasing chance of 'usefulness' is of importance to the definition of creativity, which will be further explained in section 2.3. Interaction and cooperation are elaborated on in section 2.4 when discussing team dynamic. The pre-last factor, knowledge sharing is discussed together with the importance of unplanned meetings in 2.1. Lastly, the outcomes like innovation, valorisation or creativity are substantiated in 2.3.

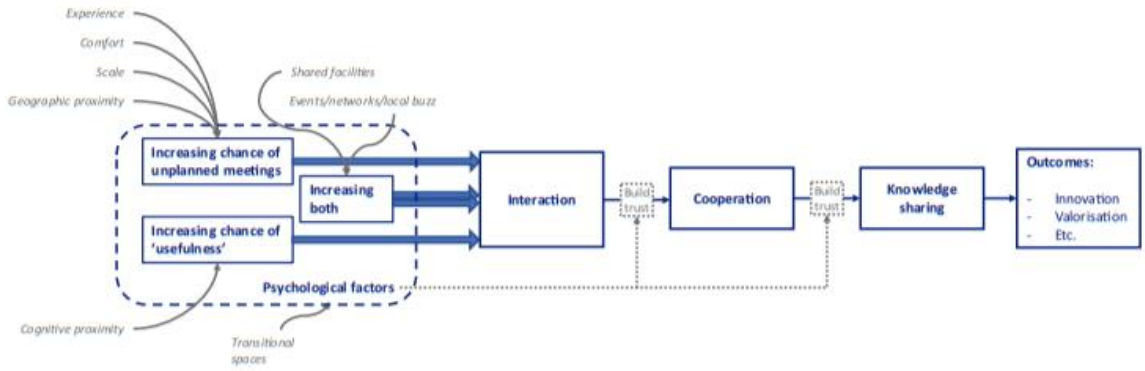


Figure 1: Relational model of campuses and innovation (Jansz et al., 2020).

Chapter 3 describes and explains the methodology including amongst others the research method, research approach and ethical considerations. Chapter 4 will present the data collected. This is a combination between quantitative data through questionnaires and qualitative data collected based on semi-structured interviews. Chapter 5 will discuss the results and draw a conclusion answering to an extent the research question(s). Additionally, in this last chapter a reflection and recommendations for future research are made.

“The ideal employee: agile, flexible, mobile and creative. The precursor: the artist.”

(Griffioen, 2016).

Klaas Huizenga – Peergitaarlicht.

2. Theoretical Framework

2.1 Space matters

To start off with, it is important to discuss how physical spaces can connect or disconnect individuals. This will be the starting point of the research, since the goal of this paper is to investigate whether the online GatherTown platform can produce the similar kinds of connections. Furthermore, it is meaningful to understand the meaning of the word 'place' as both online as well as physical places will be the main domain of this research. Both topics will be a steppingstone in understanding the relation between face-to-face interactions, the Spatial Design Course and (team) creativity.

Expressed in spatial distance, geographic proximity is the degree to which face-to-face interactions between two (or more) collaborating actors can be made possible without excessive costs (Jansz et al., 2020). Proximity and intervisibility are strongly related to where knowledge is shared (Appel – Meulenbroek et al., 2017). Usually, the smaller a space or place, the easier it is to make interaction (Hillier & Penn, 1991) and thus the easier it is to share knowledge. Increases in interactions in closer proximity have been observed in buildings (Venable, 1981), office spaces (Breznitz et al., 2018), building floors (Schwab et al., 2016), and science parks (Hu, 2008). However, one must acknowledge the existence of the proximity paradox which states that if a place is too small, interactions will not be stimulated but discouraged (Meusburger, 2009). Imagine a group of unfamiliar individuals who are packed in a small elevator.

Canter (1977) states that a place is the result of the relationships between conceptions, actions, and physical attributes. Meusburger (2009) adds to this that the meaning of the term 'place' depends on the scale of analyses, like a location, neighbourhood, city or in the focus of this research, an online classroom, and a physical classroom. A place where people are brought together can act as a meeting point of actors, including the interchange or bringing together ideas and resources (Meusburger, 2009), keep in mind the relation between face-to-face interactions and knowledge sharing (Appel – Meulenbroek et al., 2017; Jansz et al., 2020). Classes (or lectures) try to overcome distance and create relationships that are not necessarily and automatically given in a specific spatial zone. Therefore, classes can be seen as a ritual which makes them successful in overcoming spatial separation and guiding relationships, which would otherwise not be easily made in a spatial domain (Hillier & Penn, 1991). For example, social encounters in between classes will become hindered through the introduction of longer distances. In other words, random interactions are more likely to occur in smaller places. In addition, smaller spaces also provide more informality, whilst greater space translates into more formality (Hillier & Penn, 1991). Figure 2 shows this by comparing the number of dyads with distance. A dyad is a group of two persons; therefore, it is the smallest unit in which interaction can be found. This figure clearly shows the relation of dyads and distance as one can observe that the closer together, the more dyads take place.

Traditional online spaces, which have a plenary setting cannot stimulate face-to-face interactions. Examples of these online spaces are for example Google Meet, Blackboard Collaborate or Skype. In addition, an online setting also faces difficulties in terms of scheduling issues and technology difficulties (Han et al., 2017). However, Paudel (2021) states that online learning is successful and effective when learners engage in a meaningful interaction. As will be more extensively explained in section 3.1.2, the online communication platform GatherTown does provide a better opportunity to stimulate face-to-face interactions, and therefore increasing the importance of proximity and intervisibility in an online environment (GatherTown, 2020a).

The first key message to take away is that when discussing 'places', one must keep in mind the scale of analyses. Secondly, the relation between face-to-face interactions, proximity, intervisibility and knowledge sharing is significant. Commonly, the closer the proximity of individuals, the higher the intervisibility is. Therefore, random encounters are more likely to happen in smaller places due to a higher chance of face-to-face interactions which opens the gate to knowledge sharing.

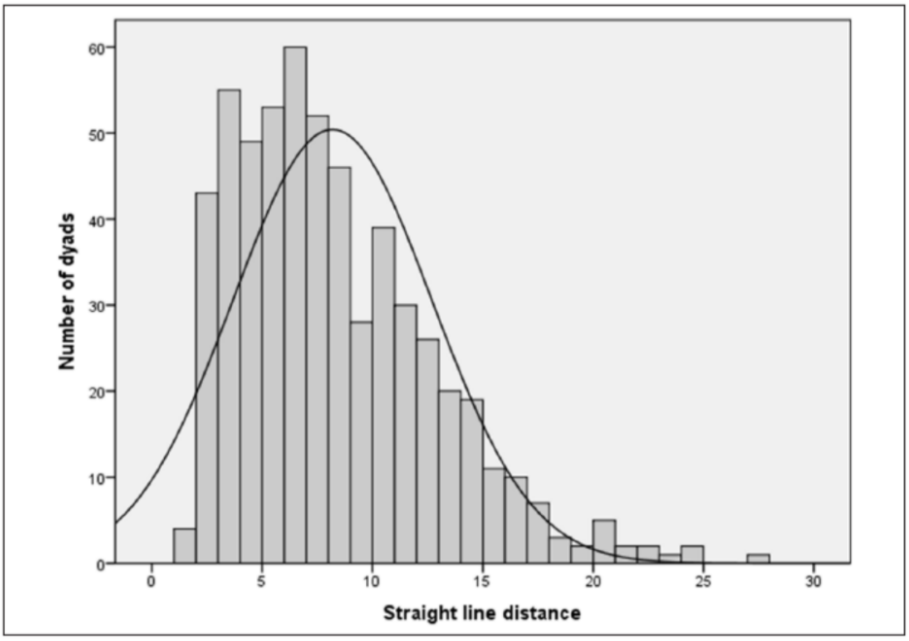


Figure 2: Straight line distances between intervisibility of dyads sharing a room (Appel-Meulenbroek et al., 2017).

2.2 Campuses

In the previous section, an introduction has been provided about the interaction between proximity and face-to-face interactions. This section will focus on not just 'any' place but is specified on campuses. This is the reason that campuses include classrooms and provide random encounters, which will be the next focus. Also, an introduction of creativity can be found in relation towards campuses and face-to-face interactions. According to Jansz et al., (2020), the expectations of a campus as a fueling mechanism to interaction leading to innovation and creativity can be substantiated with four scientific concepts.

First of all, campuses can act as meeting points to stimulate encounters and bring people, resources and ideas together, making interactions place dependent. A place can both constrain and inspire human behaviour through the affordances, the possibilities for activity offered in that specific place (Gibson, 1979; Jansz et al., 2020). The design of a place can influence the type of interactions (Coradi et al., 2015). A campus is seen as a particular action setting which is influenced and formed by specific spatial context. This is since a campus tries to stimulate a type of human behaviour (interaction) by using both the social and physical environment (Jansz et al., 2020).

Secondly, campuses provide shared facilities. Chen et al., (2016) describe that the increase of seats, commercial facilities or shelters also known as user-oriented facilities, will result in the increase of community open spaces. These types of 'third spaces' allow individuals to meet on neutral ground between their home (first space) and their work or study (second space) and to interact with strangers (Oldenburg, 1989). Once again this can be linked to proximity and intervisibility (Appel – Meulenbroek et al., 2017). These third spaces will decrease the proximity of individuals on a relatively large campus by providing them with comfort and use in the form of facilities. Therefore, there is a higher chance for individuals to meet and thus shared facilities stimulate random encounters.

Thirdly, Jansz et al, (2020) state that trust is built when interactions develop. Contact within groups and between individuals can reduce prejudices between groups group members (Pettigrew et al., 2011). In other words, less prejudices translates into more trust. Therefore, meeting people is important to build trust. In a more closed environment, where making contact is harder, less trust will be built. For trust building to be effective, positive contact is needed, which can be already well-established with a campus-lunch.

Lastly, the stimulation of innovation and creativity. Previous research has shown that unplanned or random face-to-face encounters between employees is fundamental in innovation-based organizations (Appel – Meulenbroek et al., 2017). If innovation is considered a high priority within an organisation, brief informal interactions between employees should be stimulated (Heerwagen et al., 2004). This is partly due to the fact that innovation and creativity can lead to the increase of organizational effectiveness and economic growth (Mahmood & Rufin, 2005; Mannix et al., 2009; West & Anderson, 1996). Knowledge-sharing within these short and random encounters are one of the most prominent reasons why they lead to sparking innovation (Allen & Henn, 2007; Nenonen, 2005; Wang & Wang, 2012). This leads according to Curvelo Magdaniel (2016) back to interactions on campuses, as random encounters on a campus are stimulated by being a meeting point as well as providing students and staff with shared facilities (Jansz et al., 2020). Individuals acquire a considerable amount of knowledge through the interaction with other individuals, such as developing skills, sharing knowledge and gathering experiences on campus. McCoy & Evens (2002) explain that also a campus can enhance creativity, due to the variety of learning opportunities of various actors. However, the gain of creativity cannot be guaranteed even if one is in the 'right' place, it remains a matter of being in the right place and meeting the right people, at the right time (Meusburger, 2009). How to stimulate and perhaps even guarantee creativity as well as a clearly defined definition will be discussed in section 2.3.

When focussing on the online environment, it is no surprise that a campus can act as a meeting point and provide shared facilities. Even, meta-analyses provided by Murphy & Stwert (2017) indicate that online environments are like physical classrooms as instructionally effective. Although, there is a general consensus that in online courses the withdrawal rates are higher than in physical courses (Murphy & Kenner, 2016) with an estimate of 10-40% higher dropout rates (Patterson & McFadden, 2009). In terms of trust in combination with the stimulation of creativity and innovation this can become a bottle-neck. According to Han et al., (2017), one of the main inhibitors for creative online success is distrust among users. This matter will be further analysed in 2.4.

Campuses can provide shared facilities, build trust, function as meeting grounds and are therefore more likely to stimulate creativity and innovation. This is due to the fact that opportunities for random encounters are remarkably high. Certain courses might act as mini campuses, in which encounters are encouraged and interaction is desired. One example of such a mini campus is the Spatial Design Atelier.

2.3 Individual creativity

Since creativity is stimulated in the dynamic environment of the Spatial Design Atelier (Van Dijk et al., 2018), it is interesting to ascertain what exactly is meant with the term creativity. According to Meusburger (2009), spatial planners, educational experts and psychologists all view and value creativity differently. On the one side this variety offers the opportunity that each field can contribute new insights, whilst on the other side it can create misunderstanding and hence confusion. However, when one explores various definitions within distinct fields of research, one will observe that these definitions resemble each other considerably. Obviously, rephrase: fortunately, many inspirational, diverse and refreshing interpretations of the word 'creativity' can be found. To quote Adair (2007, p. 8):

> "Creativity is the faculty of mind and spirit that enables us to bring into existence, ostensibly out of nothing, something of use, order, beauty or significance".

Figure 3: Use your imagination to create something unique (Kelley & Kelley, 2014).

Kelley & Kelley (2014) describe the faculty of mind as using your imagination to create 'something'. These elusive definitions make the concept of creativity, as it is supposed to be: creative. Notwithstanding, the core of the concept can be grasped when comparing various authors. According to Perkins (1981), the definition of creativity is relatively simple and straightforward, in the most basic sense it is about originality and a high quality. An educational scientist like Brookhart (2013) used the synonym 'new' for Perkins 'originality'. Also, creativity deals with (openness for) new ideas, using multiple sources, embracing failure (and uncertainty (Saaty, 1998)) and actively working to learn and achieve these new results (Brookhart, 2013). Management scientists describe creativity as a process leading to new, valuable ideas, products or procedures (Oldham & Cummings, 1996; Woodman et al., 1993). Both psychologists (Amabile, 1996; West, 2002) as well as scholars from the 'Thinking Skills and Creativity Journal' (Ritter et al., 2012) agree that creativity is the process, leading into ideas that are firstly original and secondly, potentially relevant or useful. If continuing to search for the definition of creativity, one will undeniably find the words (or synonyms of) a process, product, ideas, originality, surprising, new, novel, relevant and valuable (Boden, 2004; Sawyer, 2006). As can be observed in table 1, various authors share all three categorised synonyms and all cover at least two boxes.

Table 1: Creativity in all her characterizations.

Concept	**Literature**
Idea/Procedure/Product, Process	Amabile, 1996; Boden, 2004; Kelley & Kelley, 2014; Oldham & Cummings; Park et al., 2020; Ritter et al., 2012; Sawyer, 2006; West, 2002; Woodman et al., 1993.
New/Novel/ Original/Surprising	Amabile, 1996; Boden, 2004; Brookhart, 2013; Kelley & Kelley, 2014; Oldham & Cummings, 1996; Park et al., 2020; Perkins, 1981; Ritter et al., 2012; Sawyer, 2006; West, 2002; Woodman et al., 1993.
Valuable/Relevant/Useful	Adair, 2007; Amabile, 1996; Boden, 2004; Park et al., 2020; Perkins, 1981; Ritter et al., 2012; Sawyer, 2006; West, 2002.

Furthermore, there is a relation between creativity and intuition. Individuals who are nervous might make fewer errors, but will also be less creative and intuitive. On the other hand, when individuals are less nervous, they make less obvious mistakes and are more creative (Kahneman, 2011). To some degree, intuition might guide creativity to emerge (Meusburger, 2009). That is the reason why a safer working climate results in an increase of creativity. It is therefore crucial that an individual feels mentally safe within their environment. This is specifically important when working in groups, which will be more elaborated in the following section.

What creativity is not. Creativity is not a copy-paste synonym for artistically pleasing, cleverness, enthusiasm, humour or persuasiveness (Brookhart, 2013). Also, knowledge or intelligence do not assure creativity, it is necessary but plainly not sufficient (Shekerjian 1990; Sternberg & O'Hara, 1999). Creativity is not necessarily novel when it is solely different from something observed before. Here the combination between new ideas and value is crucial, value is needed in being new and different (Meusburger, 2009). This is to say that products and ideas that are found to be solely original can be demonstrated to be of no use when they are not competent and effective enough to be qualified as creative (Runco & Jaeger, 2012). The product must therefore, besides containing something unique, also encompass value and quality. In other words, a combination of novelty and appropriateness.

A more holistic, anew and very interesting definition is provided by Puryear & Lamp (2020).

> "Creativity is the interaction among aptitude, process, and environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context" (Puryear & Lamp, 2020, p. 206).

However, for this paper, the definition of Park et al., (2020) is used to describe what creativity is: 'creativity is the production of useful and novel ideas'. This definition is firstly compact and clear, secondly it is recent and thirdly it covers all three boxes displayed in table 1.

To conclude, throughout all definitions shown before some individual words stand out and unite through all papers. One of the newest and most common definitions is provided by Park et al., (2020). This definition of the word creativity involves the production (process), of valuable and novel ideas. However, creativity does not solely rely on individuals. As will be discussed in section 2.4, as creativity can also occur in groups.

2.4 Team creativity

Groups as well as individuals produce creativity (Hargadon & Bechky, 2006; Mannix et al., 2009; Sawyer, 2003; Sutton & Hargadon, 1996). Regarding groups performing in design studies, Cross (2007) reflected on 40 years of design studies and concluded that the Design Research Society promotes the research into and the study of the process of designing in many different fields. Being aware of this, it is of interest to move beyond analysing the definition of creativity as is done in 2.3 and investigate group creativity and team dynamics. As is will be introduced in 3.1.1.1, the Spatial Design Atelier course is in essence focussed on co-designing, in which teams have a shared identical goal and cooperate to reach this goal whilst making use of their varying perspectives (Bucciarelli, 2002; Détienne, 2006; Schmidt, 1994; Van Dijk et al., 2018). Therefore, co-designing is the main focus when discussing team dynamics. The researcher is aware of the roles within teams, like Belbin's test. However, this research will not address those roles as it needs more in-depth research. In addition, researchers both argue in favour (Chong, 2007) and against (McCrimmon, 1995).

To elaborate on the definition of creativity: team creativity is defined as a collaborative and social phenomenon that consequently demands discussion and interaction (Hadzigeorgiou et al., 2012). This collective phenomenon attempts to create novel and useful products whilst combining the emotional, behavioural and cognitive differences of the individuals involved (Černevičiūtė & Strazdas, 2018). This does however, not mean that all members must have the same creative input. In a lot of teams there is

one lead creator whose thoughts and ideas are the basis on which the team will develop. Černevičiūtė & Strazdas (2018) state that the productivity and satisfaction of teamwork consist of six micro factors: the team's openness to ideas, the unity of a team, learning from mistakes, team autonomy, respect within a team and interesting team tasks. Han et al., (2017) focus more on online team creativity instead of physical team productivity. According to Han et al., (2017), the five main inhibitors to creative online success are distrust, generational differences in views, personality differences, scheduling issues and technology difficulties.

Table 2: The five inhibitors for virtual team creativity and success (Han et al., 2017).

Category	First-order categories	Description
Inhibitors for team creativity and success	Distrust	Reducing the ability to speak openly to discuss individual ideas without ridicule or judgment
	Personality differences	Reference of individual personalities traits of team members
	Generational differences in views	References to both the age and experience levels of team members
	Scheduling issues	Coordinating meeting schedule according to time zone differences and different individual schedules
	Technology	Differences in technological proficiency

Bucciarelli (1988) has noticed that within a design team, negotiations arise due to the combination of individuals from various disciplines, all having contrasting limitations and skills (Cross & Cross, 1995). The same phenomena was observed by Détienne (2005) during co-design meetings in the engineering sector. These negotiations arise due to different viewpoints of the collaborating individuals. This can be due to the fact that teams consist of individuals with different individual personalities, external factors or even culture (Myers, 2013). As a result, teamwork is likely to stimulate conflicts as a result of opposed ideas (Klein & Lu, 1989) and it is therefore crucial for teams to mitigate and avoid such conflicts (Cross & Cross, 1995). Whilst working on the same object, each individual will see the object differently due to a differentiation of the designers domain (Bucciarelli, 2002). Despite the sector, solutions are as a result of negotiations at no time based on solely technical issue-solving criteria, since they result from compromises (Martin et al., 2000).

Although conflicts might arise, the actual opportunity to share thoughts and new ideas within teams are important. Streicher et al., (2012) confirmed that members of the team that were able to explain their novel thoughts were in the long run more creative than other team members to whom no voice was given. This has to do with the fact that creative ideas are developed by individuals, but then depends on whether the teams composition and processes allow these ideas to be developed into a creative output (Zhang, et al. 2019). Adding to that, the performance of cohesive teams will increase the creative tasks, stating that mutually involved team members in collaborative situations will thrive better in problem solving (Hamalainen, 2008; Rodríguez-Sánchez et al., 2017).

Individuals' relations within a team are important since trustworthy relations will eventually lower the barriers to share knowledge (Renzi, 2008). Sharing knowledge and resources will ultimately benefit creativity (Park et al., 2020). Therefore, the creative output of teams is partly dependent on this team process of being able to share information (Renzi, 2008; Zhang et al., 2019). Also feeling safe within a team as well as feeling enthusiastic will ultimately result in more creativity (Bakker & Xanthopoulou, 2013; Hakanen et al., 2008). This feeling of psychological safety is all-encompassing and means that individuals are valued for their talents and skills, daring to make mistakes and share information (Edmondson, 1999; Zhang et al., 2010). That is to say that a supportive working climate is important since a more spontaneous and professional relationship between the peer and the students will turn out in more creativity (Bouckenooghe & Menguc, 2018; Vincent-Lancrin et al., 2019).

A lot of individuals nowadays still believe that being a creative mind is something like an otherworldly gift or a sacred power of some sort (Chen & Chen 2019). But president of Pixar Animations Studios Ed Catmull (2008) states that team creativity is not a matter of mere luck, but a combination of managing the teams talent and the creation of collective creativity. One of these factors concerns collective task engagement. This is to say that highly cohesive teams will develop their team performance regarding creative tasks due to their close collaboration and their equal share of activities (Rodríguez-Sánchez et al., 2017).

To conclude, compared to individual creativity, team creativity regards discussion and interaction (Hadzigeorgiou et al., 2012). Additionally, factors like trust (Han et al., 2017), personality differences (Černevičiūtė & Strazdas, 2018; Han et al., 2017) and the team cohesiveness (Rodríguez-Sánchez et al., 2017) are crucial in evaluating team creativity.

2.5 Conceptual model

The theory discussed regarding the conceptual model will connect and integrate creativity with the two platforms researched. Both the physical Design Atelier as well as GatherTown will be introduced and the relation to creativity will be explained. Further information on the Physical Design Atelier and GatherTown can be found in chapter 3.

Space matters

Physical space is closely related to geographic proximity, face-to-face interactions and intervisibility Jansz et al., 2020). This is to say, the shorter the distance between two subjects within a place, the easier it is to interact (Hillier & Penn, 1991). Obviously, one must pay attention to the proximity paradox, which states that if too small it will countereffect the increase of interaction (Meusburger, 2009). A good example of a specific place is a class, which tries to create relationships through a ritual of written and unwritten rules (Hillier & Penn, 1991). Classrooms and similar spaces can act as a meeting point where actors can interact and share ideas and resources (Meusburger, 2009). Furthermore, face-to-face interactions increase the sharing of knowledge amongst individuals (Appel – Meulenbroek et al., 2017; Jansz et al., 2020). Many online spaces do not stimulate face-to-face interactions, which causes an increase in distrust, making physical space favourable for interaction between individuals (Han et al., 2017). An important relation is that informality will increase meaningful face-to-face interactions, leading to knowledge sharing and the stimulation and creation of creativity (Appel – Meulenbroek et al., 2017; Hillier & Penn, 1991; Jansz et al., 2020). This phenomenon also works the other way around (Hillier & Penn, 1991).

Creativity

Creativity is the production of novel and useful ideas (Park et al., 2020). Creativity can be experienced on an individual and collaborative level. On a collaborative level, one has to take into account the social and collaborative aspect of interaction and discussion (Hadzigeorgiou et al., 2012). In other words, team creativity is the combination of emotional, cognitive and behavioural differences of all team members involved (Černevičiūtė & Strazdas, 2018). According to Han et al., (2017), online team creativity has

five main inhibitors: distrust, personality differences, scheduling issues, generational differences in views and technology difficulties. Černevičiūtė & Strazdas (2018) state that the creativity and satisfaction of teams relies on six micro factors: the unity of a team, the team's openness to ideas, learning from mistakes, respect within a team, interesting team tasks and team autonomy.

Campuses and creativity

Campuses can fuel meaningful interactions which can result in creativity. Campuses can stimulate interaction through bringing together ideas, resources and people (Jansz et al., 2020). This in combination with user-oriented facilities (Chen et al., 2016) allow individuals to meet in third spaces where they can interact with strangers (Oldenburg, 1989). These shared facilities decrease proximity and increase intervisibility, increasing the chance for individuals to meet (Appel – Meulenbroek et al., 2017). Campuses also build trust through interactions between individuals and groups (Jansz et al., 2020). Due to the shared-facilities and bringing individuals together, the increase of face-to-face encounters is possible (Curvelo Magdaniel, 2016). This is since individuals acquire a variety of learning opportunities provided by a campus or attained through the interpersonal contact (McCoy & Evans, 2002).

Design Atelier and creativity

The Spatial Design Atelier as a course requires students to be creative and focus on problem solving activities (Van Dijk et al., 2018). Assignments that are explored in the Spatial Design Atelier require students to produce innovative ideas and investigate unknown situations. Moreover, the course assignments are set up to stimulate creativity (Brookhart, 2013; Van Dijk et al., 2018). Furthermore, when students employ collective stimulated learning and feel ownership, they will act more creatively (Padget, 2013; Park et al., 2020). As a physical space or place, the Design Atelier can provide students more creativity due to the size of the room. Due to the fact that the Design Atelier is relatively small, around eight large group tables fit the room, increasing the chance of interactions (Appel – Meulenbroek et al., 2017; Hillier & Penn, 1991). In addition, due to the physical size of the room, face-to-face interactions occur due to random encounters, which can result in an increase of creativity (Jansz et al., 2020). Rather than the type of assignment and the physical place, the social construction based on (unwritten) rules is also important to take into account. Social constructions are a contributing factor, since the course is based on group work (Van Dijk et al., 2018). Including stimulating creativity through discussions (Kelley & Kelley, 2014). This is a result of group collaboration, which contributes to the creative outcomes of the assignments (Hargadon & Bechky, 2006; Mannix et al., 2009; Sawyer, 2003; Sutton & Hargadon, 1996).

GatherTown and creativity

In general, online platforms allow individuals to collaborate remotely (Hartnett, 2016; Saifuddin, 2017). Advantages are increased flexibility of meeting times and physical appearances (Bonk & Khoo, 2014). Disadvantages can be additional stress (Kusnayat et al., 2020), a lower level of motivation (Hartnett, 2016) and a higher level of distrust (Han et al., 2017). GatherTown specifically adds extra elements like a 2D map and the opportunity to have individual or group conversation to the established online platforms (GatherTown, 2020a). The way students within an educational setting evaluate GatherTown regarding creativity is until now unknown. How does this new online platform perform regarding creativity and to what extent can it stimulate the creative process? The assignments are the same as in the physical course and should therefore already stimulate creativity (Brookhart, 2013; Van Dijk et al., 2018). The social construction regarding working in teams and flexibility in terms of working hours, breaks and the level of noise are also identical (Van Dijk et al., 2018). Regarding the physical appearance of GatherTown, in contrast to other online platforms, GatherTown adds a 2D map and therefore introduces an element of intervisibility and random interactions (GatherTown, 2020a). Therefore, hypothetically speaking, due to the introduction of intervisibility and the opportunity to start face-to-

face interactions, GatherTown will stimulate creativity (Appel – Meulenbroek et al., 2017; Hillier & Penn, 1991; Jansz et al., 2020). In addition, GatherTown also introduces third spaces, which should also contribute to creativity (Chen et al., 2016; Oldenburg, 1989). Therefore, the GatherTown platform allows students to have a quick talk in a third space, a private one-on-one conversation and group conference (GatherTown, 2020b).

The conceptual model

In the previous sections various relations between creativity and both physical and online space are explained. These various creative process lead to a creative product. For this thesis, both the process of creativity and the product are interesting. As can be witnessed in figure 4, both campuses, the Spatial Design Atelier and GatherTown can influence the processes of creativity. Also, within the physical environment one can witness the five online hindrances regarding group creativity as is described by Han et al., (2017).

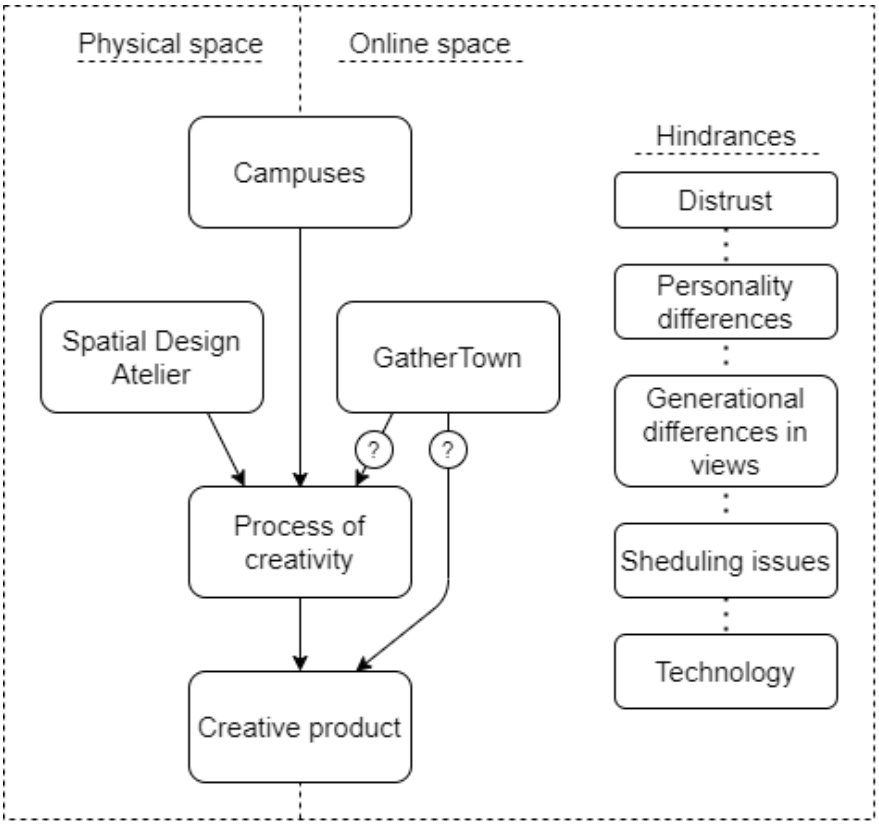


Figure 4: Conceptual model.

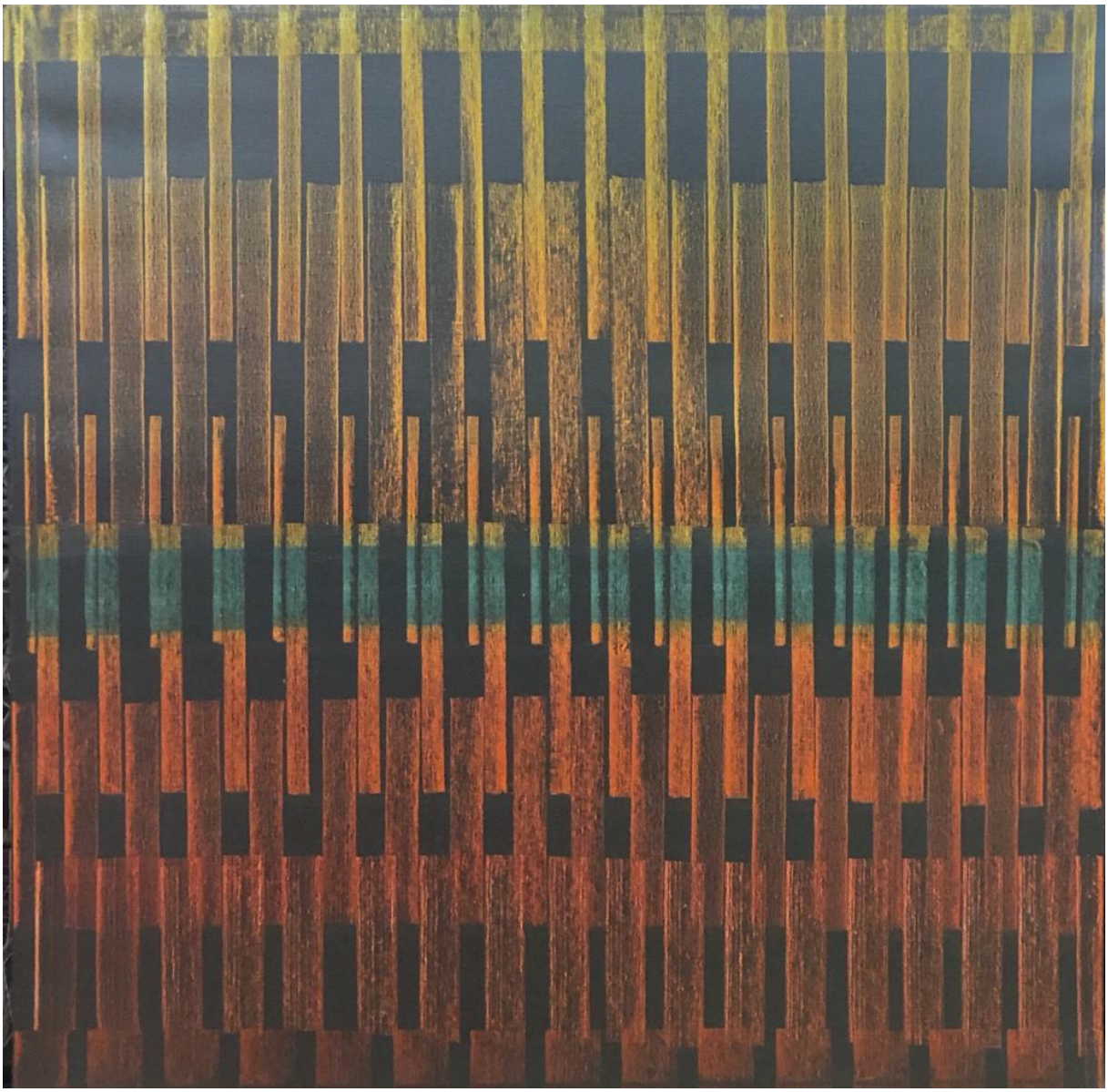
All theories discussed previously are integrated with a triangulation process. The theory provides a foundation for quantitative and qualitative data collection. For further inquiry about data collection methods, see chapter 3. The collected quantitative data is used to analyse *if* there is a certain relationship/difference. The qualitative data collection method is based both on the theory and the quantitative data collection instrument and identifies *why* this difference exists.

2.6 Hypotheses

After having carefully examined the literature and constructed a conceptual model, the hypotheses will be formulated. The researcher presumes that GatherTown will not be as good as the physical Design Atelier in terms of stimulating and facilitating creativity. Although, GatherTown might be a valuable alternative when teaching online and it will be more beneficial than regular plenary online meeting platforms. The researcher assumes that the physical Design Atelier will be of more value due to a more informal meeting environment. Even though GatherTown is being highly helpful in downscaling formality, the researcher does believe that physical real live encounters will be more informal and more relevant. Since face-to-face encounters are in relation with creativity, the researcher therefore believes that creativity in the GatherTown groups will be slightly less present. The researcher does place a footnote, since GatherTown is used for the first time the lecturers might take this into account when distributing final grades.

“Words are, in my not-so-humble opinion, our most inexhaustible source of magic.”

(Harry Potter and the Deathly Hallows – Part 2, 2011)



Tomasz Marćzewski – Zamknięty.

3 Methodology

3.1. Research location

The unit of analysis in a case study is the case on which the research is focused (Yin, 2012). The Spatial Design Atelier Course is the course in which behaviour of students is identified. 'GatherTown' and the physical Design Atelier both served as the case and as the spatial boundary. Students who followed the course Spatial Design Atelier used the online platform GatherTown, or a hybrid version in combination with the physical Design Atelier. More in-detail information about the distribution of students is given in 3.1.1. The timeframe started in February 2021 and the course ended at the end of April. The data collection process ran from February 2021 until May 2021. The theoretical scope is defined through literature and mostly focuses on online education, student behaviour, face-to-face contact and creativity.

The researcher chose to employ a case for a few reasons. The first reason is that due to the current structure of the course, the research had two regimes with the same learning goals. As will be explained in 3.1.1, the course was divided into two main groups. One group being able to work together physically and another group not having this opportunity. This situation was the perfect base to perform a case study experiment as only one factor differs. Also, the researcher and this course shared the same faculty (Faculty of Spatial Sciences), making it easier to confidentially and anonymously share grades. This insight helped the researcher to better analyse and research the difference between the two groups. Lastly, the students were more accessible to be interviewed due to connections as a result of engaging in the same faculty. A more extensive on why to use a case-study for this research is given in 3.2.1

3.1.1 The Course: Spatial Design Atelier (SD3)

3.1.1.1. Structure of the course

The Spatial Design Atelier (course code: SD3), is a first year course of the Bachelor Spatial Planning and Design, provided by the University of Groningen. This course, which employs the learning-by-doing strategy, was this year (2020/2021) divided into four groups of around 35 students. Groups A and B spend 12 hours per week in GatherTown. Since the characteristics of these two groups are identical, they are labelled as group 1 in this research. Group C spend eight hours in GatherTown and four hours within the physical campus building, whilst the last group (group D) spend four hours in GatherTown and eight hours in the campus building (see table 3). Even though these two groups had slightly different characteristics, they are treated the same for this research and referred to as group 2. The allocation was not randomly assigned, instead, students could sign up for the 'on campus' groups. Other students could, because of the Covid-19 virus, not attend on campus activities and were thus bound to online classes.

Table 3: Group division.

	Group 1 (A&B)	Group 2 (C)	Group 2 (D)
Amount of students	70	35	35
Environment	GatherTown	GatherTown / Studio	GatherTown / Studio
Time/week	12 hours	8 hours / 4 hours	4 hours / 8 hours

The main objective of the Spatial Design Atelier course is:

> "…to introduce you to the process of creating a spatial plan for a particular area, in this case the Groningen Assen region" (Bahrami et al., 2021).

The course has two main team assignments. The first assignment is the so-called 'Territorial Analysis'. Second and final team assignment is the 'Regional and Local design for the Groningen Assen region'. Important skills students will be training are their analytical, creative and reflective skills. Also, plan making and designing is teamwork. The grading criteria for both assignments are implicitly and explicitly focussed on team creativity. Whether this is through developing a territorial regional solution, present spatial requirements or make the analysis visually attractive (Bahrami et al., 2021). However, creativity is not the only score. It is interwoven throughout all criteria, but not the only criteria.

Table 4: Grading criteria for the mid-term assignment (Bahrami et al., 2021).

The posters: *1- Content*	--	-	0	+	++
... Show the thematic analysis of the territorial regional situation and describe the regional thematic social and environmental challenges for all three themes	0	1.5	3	4.5	6
... Present the spatial requirements of the regional thematic ambition for each theme	0	1.5	3	4.5	6
... Critically present the relation between different themes (layers)	0	1	2	3	4
2- Visual and communicative quality					
... have appropriate use of different mediums like maps, text, pictures, sketches and other visuals, and are informative, well-structured and visually attractive	0	1	2	3	4

Table 5: Grading criteria for the final assignment (Bahrami et al., 2021).

The posters: *1- Content*	--	-	0	+	++
... show an original and appropriate regional vision and spatial concept for the Groningen Assen region through diagrams, sketches, maps and other visuals	0	2	4	6	8
... present logical spatial principles, indicate locations for new spatial developments for at least five themes, reveals locations with overlapping/conflicting land use claims,	0	2	4	6	8
... include a local plan for a 3 by 3 km area in the Groningen Assen region that addresses at least four themes, and foresees a logical and realistic future spatial situation	0	2	4	6	8
... present a convincing narrative that explains the reasoning, connects the regional challenges, the vision and the local plan, and which underpins the choices made	0	2	4	6	8
2- Visual and communicative quality					
... have appropriate use of different mediums like maps, text, pictures, sketches and other visuals, and are informative, well-structured and visually attractive	0	2	4	6	8

3.1.1.2 The course in relation to creativity

The Spatial Design Atelier is a course where students are asked to be creative and work on problem-solving activities (Van Dijk et al., 2018). Within this specific course, the interaction between students is essential, as they are divided into teams. Therefore, face-to-face interaction is important as random encounters which could potentially spark creativity (Jansz et al., 2020). Due to the fact that the classroom is small, theoretically speaking, the chance of interactions is high (Appel – Meulenbroek et al., 2017;

Hillier & Penn, 1991). What is so special about this course, why is it essential, and how does it specifically relate to creativity?

If all steps are well-defined and explained in class (read: standardised classroom learning), do we develop ourselves and do we stimulate our own imagination and curiosity? Moreau & Engeset (2016), found that standardised tests can have a negative influence on students' tendency to participate in less-structured activities, as well as a decrease in creativity. Psychologist Peter Gray (2013) raised another important question regarding the current learning system:

> "Do we need more people who are good at memorising answers to questions and feeding them back? Who dutifully does what they are told, no questions asked?" (2013, website).

The Spatial Design Atelier has as its main objective the translation by students from certain desires to spatial investments whilst working in a learning-by-doing environment (Van Dijk et al., 2018). This environment stimulates students to try, experience and challenge themselves as well as reflect upon themselves in order to acquire self-awareness whilst working in groups. In this dynamic study approach, professors challenge students and spark discussions. Various points of view are expressed and there is no 'right' answer. Neither will a professor give an answer for free, instead he or she challenges the students to think critically themselves and reflect where they stand. Here, the goal is to stimulate creativity through these discussions (Kelley & Kelley, 2014).

Assignments that stimulate and require students to investigate new situations and produce new ideas are expected to cherish student creativity (Brookhart, 2013). Moreover, students are more creative when they feel ownership, employ collective stimulated learning tasks (Padget, 2013) and are self-confident about their creative abilities (Park et al., 2020). Even so, creativity as a collective group activity can occur through group interaction since perspectives can vary, concluding that not only individuals can produce creativity (Hargadon & Bechky, 2006; Mannix et al., 2009; Sawyer, 2003; Sutton & Hargadon, 1996).

Combining literature and the course objectives, one can assume that the previously mentioned characteristics of the SD3 course are likely to stimulate and experience students' creativity. Such a course is well valued since problem-solving and creative thinking are very desired attributes for 21st century graduates (Casner-Lotto & Barrington, 2006; Mao et al., 2020). Therefore, curricula which have been carefully adapted to include problem solving and stimulation of creativity are of grave importance for students to ride along on this global change (Martz et al., 2017). Also, this format of course allows students to learn and develop skills such as anticipation, creativity development, critical thinking, flexibility, putting ideas into context and reflecting on various perspectives, which are crucial for self-development (Černevičiūtė & Strazdas, 2018; Khanova et al., 2015). The Spatial Design Atelier course is in essence focussed on the co-designing of individual actors in the form of teams. These teams have a shared identical goal and must cooperate to reach this goal whilst exploring the varying perspectives of the team members (Bucciarelli, 2002; Détienne, 2006; Schmidt, 1994).

3.1.2 GatherTown

For the first time in the history of the course, the online platform GatherTown has been used. This is due to the COVID-19 pandemic and its consequences of closing the physical university. However, as the country (the Netherlands) was slowly opening up during March/April 2021, half of the student population could attend class physically. Also, working in the online environment was convenient for international students who had travelled to their home countries because of the pandemic. Or, students who because of pre-conditions or moral beliefs did not want to attend physical classes found a solution offered in the form of the online environment GatherTown. The design of the GatherTown environment is shown in figure 11.

GatherTown is a virtual (online) space where individuals can interact more effectively. This is due to the combination of a 2D map and the opportunity to video call (GatherTown, 2020a). When being in close proximity to one another, a connection can be made to interact. Private conversations can be held, as well as the opportunity to follow lectures with all fellow students. GatherTown provides an online campus in which you can have a chat in the coffee corner, bump into companions whilst strolling around or attend a lecture. The freedom to do more than just sitting and watching a lecture at home, but rather actually being able to connect is unique. A few more features will be explained in detail (GatherTown, 2020b) as well as examples from GatherTown used at the Spatial Design Atelier and an overview of the entire working room. GatherTown as a meeting platform is gaining more popularity. In October 2020, AmeriFlux held a meeting consisting of 400 participants on the platform. 100% of the attendees stated in the post-meeting survey that they would use GatherTown again (Fisher et al., 2021). Moreover, GatherTown stimulates the possibility of random unplanned encounters, unlike traditional plenary online meeting platforms.

The images used in this section are specific images from the GatherTown environment of the Spatial Design Atelier course. One must keep in mind that the GatherTown environment can be modified to any outline and map as required. To illustrate how GatherTown can be used, general functions are described in combination with specific illustrations from the course. Within GatherTown various private spaces can be assigned. If one steps within this parameter, everyone in this area can see and talk to each other and thus distance does not matter for the connection. This results in more flexible opportunities to have dynamic conversations. Instead of seeing and talking to everyone online, you can specifically choose to start a private conversation. These areas are perfect for a quick talk, one-on-one conversations as well as a group consultation. Figure 5 shows a private space in the hallway, whilst figure 6 shows a whole meeting room as a private space.

Figure 5: Every individual sitting on one of the white chairs can interact with each other.

Figure 6: Also whole rooms can work as a private space, in this yellow room a collaborative meeting can be hosted.

Besides private spaces, moderators can also use the spotlight (podium) function to present. With this tool, participants within the podium area can observe a shared video, presentation or the presenter conversing. This function is mostly used for lectures or announcements. In addition, the podium can also be used as a Question & Answer session. The audience can share questions or comments by raising their hand and being invited on stage. In figure 7 such a podium (spotlight) can be observed. In this example, the orange dot is the presenter's location. The audience can take a seat on one of the red chairs, although solely standing on the blue carpet will suffice to listen to the presenter.

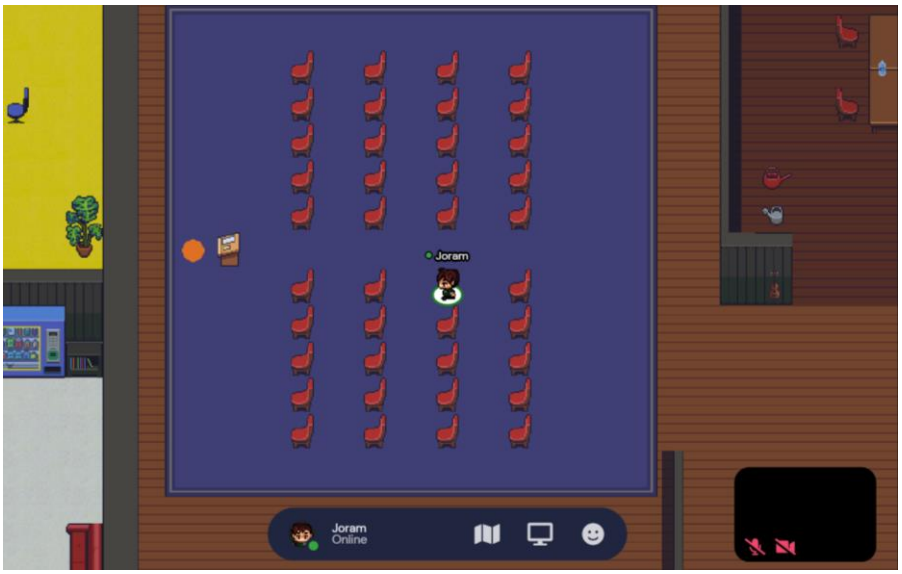


Figure 7: This blue space can host a plenary meeting.

Within GatherTown, your availability is shown with colours. Green represents an active status, yellow characterising that one is open for a discussion but also concentrated on their work and red means that an individual is busy. However, in the red status other people can call for attention, but the camera and microphone need to be turned on manually. When being connected to another user, a screen share can be used to stream one's screen to another user. In figure 8 one can observe that the user 'Joram' has an active (green) status.

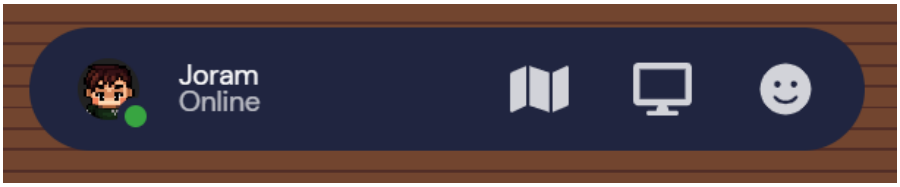


Figure 8: The users' current status in GatherTown: Green.

More communication opportunities are raising your hand, the chat and the whiteboard. In the participants list, you can see if someone raised their hand. Individuals raising their hand can be found at the top of the list. Moderators, lecturers or student assistants in the Spatial Design Atelier can consequently click on these individuals, spotlight them in order for them to speak up. Regarding the chat, three different options are available, the local, global and private chat. The local chat can be used to chat with all GatherTown users connected. This can be individuals one is in close proximity with or the members present in the shared private room. As a consequence, every user has a different chat history. A global chat will as the name suggests send a message to every individual present. This is most useful for lecturers to make announcements important to all students. The third option to chat is the private chat, which can be used to send a direct message to another person. Furthermore, whiteboards can be used to draw, explain and process ideas. It enlarges the scope of typing or speaking through visualisation. Extra features that could be added are games like chess, poker or set. Anyone present at a game table can play the game. However, in the GatherTown Spatial Design Atelier such game areas were not used.

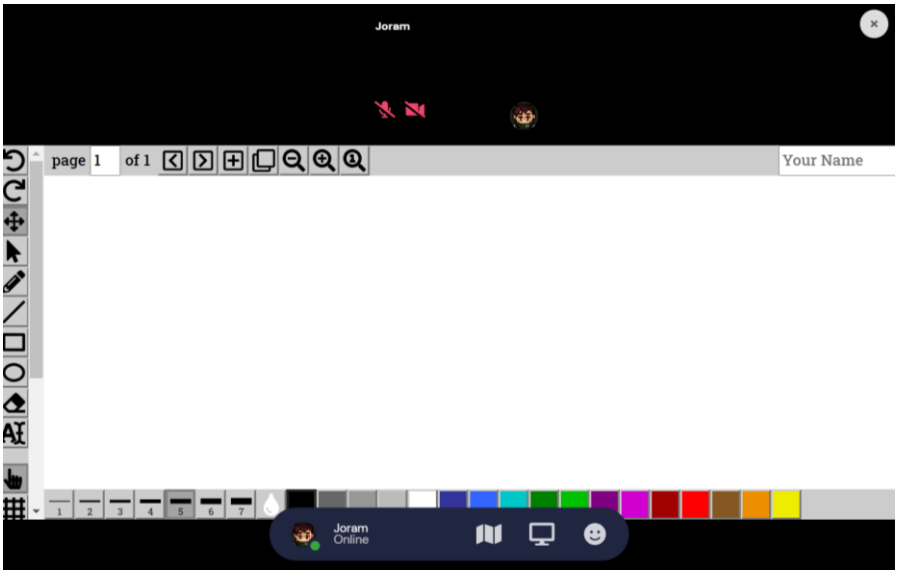


Figure 9: An example of an empty whiteboard.

Knowing most of the important features, an overview of the GatherTown Spatial Design Atelier can be displayed. When entering the course with a password, one can choose to go to room A, B, C or D (figure 10). All student groups are assigned to one of these groups, depending on the hours spent in GatherTown and on the physical campus (see 3.1.1.1). The internal design of all rooms are identical. As can be seen in figure 11, the place consists of two private meeting rooms in the North, four in the West and one in the East. In the middle, a large blue carpet can be found including 40 red chairs, an orange presenters spot and a speaker's stand. Various smaller private spaces (a centred table surrounded by chairs) can be found in the large hallway and five more in the south-east.

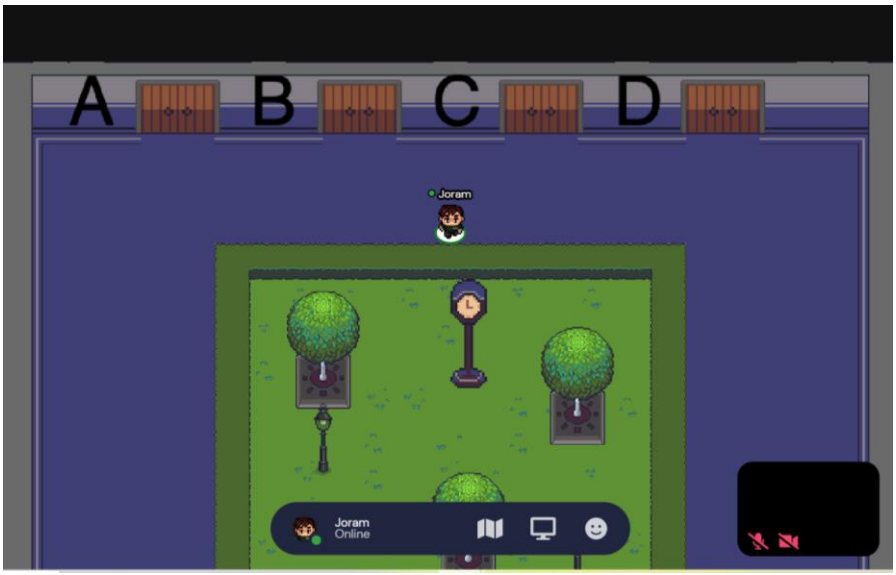


Figure 10: The main location when entering GatherTown, providing users the opportunity to go to a specific room.

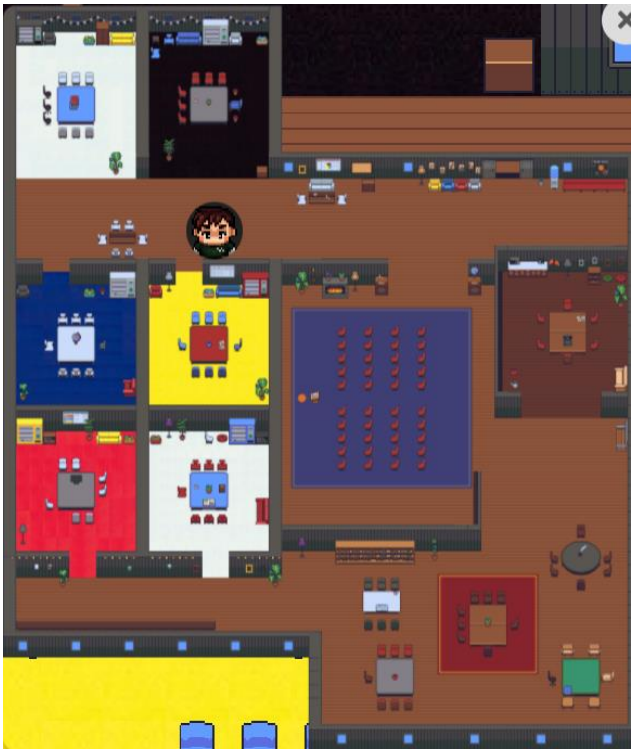


Figure 11: The overview of all rooms in the Spatial Design Atelier.

Due to the great influence of the coronavirus (Surani & Hamidah, 2020), education needed to act flexibly (Ilyasa et al., 2020). Face-to-face interactions are harder as the virus is spread through physical contact (Surani & Hamidah, 2020). Besides the coronavirus, globalization also caused an urge to work collaboratively online (Samsonovich & Chubarov, 2021). Globalization combined with communication technology tools like GatherTown, allow team members to share their perspectives and work collectively as a team in an online environment (Algesheimer et al., 2011; Chen & Chen, 2019; Funk, 2014). These new kinds of technological communication tools allow individuals to work collectively, whilst being physically separated (Hartnett, 2016; Saifuddin, 2017). Being physically separated has both positive and negative effects (Lee & Martin, 2017). GatherTown, as a specific online communication tool, is until now well evaluated regarding large events (Fisher et al., 2021). GatherTown in an

educational environment, especially with a specific focus towards creativity, is still to be researched. To set up such research effectively, a clear definition of creativity is essential.

3.1.3 Physical Design Atelier

Normally, the Design Atelier is a large building located on the campus. Students then visit varying on the day to this physical Design Atelier. Each room contains tables around which the teams sit. Students did not have a designated table and can therefore switch table/room depending on the day. Students were allowed to walk around and so did the student-assistants and professors. Also, there was no limit on the noise level. In other words, students did not have to be quiet necessarily. As can be seen in figure 12, students are collectively designing in this year's version of the course.

Figure 12: Students sketching and discussing in the physical Design Atelier

3.2 Research method

3.2.1 Research approach

This thesis employs case study research in order to identify and evaluate students' experience of the online GatherTown platform, with a specific focus on the (in)existence of creativity. Most authors state that creativity is not fully reducible to quantitative data collection (Meusburger, 2009). Therefore, this study employs triangulation, as is more elaborated on in the next section. According to Meusburger (2009), four types of approaches are available to measure creativity. The first one deals with analysing biographies of ingenious, innovative and creative individuals and can include both quantitative as well as qualitative data. This methodology is relatively old and is already in use according to Galton (1869) since the mid-nineteenth century. Furthermore, analysing biographies is not considered to be objective, rather it gives a representation and explanation of how these individuals work (Westland, 1969). For this study, all individuals will be analysed in order to compare GatherTown with a physical Design Atelier. Therefore, the first approach does not fit the research design. The second approach is focussed on similar characteristics or traits between creative individuals (Meusburger, 2009). However, for this research two platforms will be compared, not the quality traits of individual students. The third approach questions different cities, places or time periods and compares which context has produced more creative products like scientific awards or the number of patents (Acham, 2003). This concept does not fit this particular study since it focuses on the past including her activities. Rather, this study analyses the present and follows an academic course. However, the grades of two different places (GatherTown and hybrid classes) are compared with statistical analyses. Therefore, this approach does in a way fit slightly. The fourth and last approach entails a controlled experiment and employs cognitive task analyses in order to identify the component of the process which stimulates creative thinking (Mayer, 1999). The goal of this approach is to compare two groups regarding the number of creative ideas. By carefully changing and selecting a specific environment, the results of the individuals can be compared. This

approach can be considered the overarching design of this study as it is comparing two controlled situations and its present results. Along with research provided in 3.1, this can be considered one of the main reasons to employ a case study.

3.2.2 Data collection instrument

This research gathered both primary and secondary data in order to gain a comprehensive understanding of the specific case. This mixed method widens the understanding and will strengthen the validity of the results (Tyrrell, 2016). More specifically, this is done through the use of literature, quantitative and qualitative data, this case study will make use of triangulation in optima forma. Each data collection instrument is linked to one or more sub questions. The quantitative data will be collected through a survey and will compare assignment grades, whilst the qualitative data will be assembled through semi-structured interviews. The first two sub questions, how to define creativity and the relation to face-to-face contact are mainly answered through the use of literature. Sub question number three and four can be evaluated with the use of quantitative data in the form of a questionnaire survey and deal with student creativity within their working environment (GatherTown or onside campus). The questions are aimed at the Spatial Atelier Course (SD3) and will function as an after-evaluation towards participating students. Additionally, the final grades are compared to explore if there is any difference between groups who followed their meetings through GatherTown or on the campus. Sub question number five (and at the same time three and four) can be best researched through qualitative data and collected through semi-structured interviews focussed on students, designed and acquired by the researcher. Similar semi structured interviews are conducted with a student-assistant in order to compare their results and give more depth to the analyses. Eventually, the quantitative data will analyse the question *if* there is a difference or not, and the qualitative data will answer the question of *why*.

Table 6: Daya analyses scheme.

Question	Which information	Moment of collection	Main source	Documentation method	How to analyse
How to define creativity?	Definitions.	1st of March – 31th of April.	Academic articles and books.	Document archive.	Literature review.
How does creativity show up during face-to-face interactions in previous research?	Theoretical understanding.	1st of March – 31th of April.	Academic articles and books.	Document archive.	Literature review.
To what extent do students experience moments of creativity in GatherTown?	Experiences to draw a comparative analyses.	24th of March – 4th of April.	A survey & grade comparison.	SPSS.	Quantitative data analysis.
To what extent do students experience moments of creativity on the campus?	Experiences to draw a comparative analyses.	24th of March – 4th of April.	A survey & grade comparison.	SPSS.	Quantitative data analysis.
How are random encounters on GatherTown valued by students?	Experiences and evaluation to link to literature.	21st of April – 6th of May.	Semi-structured interviews.	Transcript.	Coding in AtlasTi & Content analysis.

The literature study is an ongoing research which has started from the beginning of the research at the beginning of January. The quantitative data is collected first in the form of a survey and is distributed in consensus with the supervisor at a date between 24th of March – 4th of April. When the results were obtained, the researcher quickly scanned the results to form an insight into the results. After the first scan of the quantitative data, the researcher interviewed multiple students between the 21st of April and the 6th of May. After interviewing students, a student-assistant was interviewed. This was done to ask extra questions which were sparked because of the students. Therefore, a more complete interview is conducted with the student-assistant. Lastly, a statistical comparison between grades is made to complete the triangulation. The data is collected through students following the course and a student-assistant. This data was easy to access due to close ties to the specific faculty. This gained more opportunities to receive data and also ensured more trust.

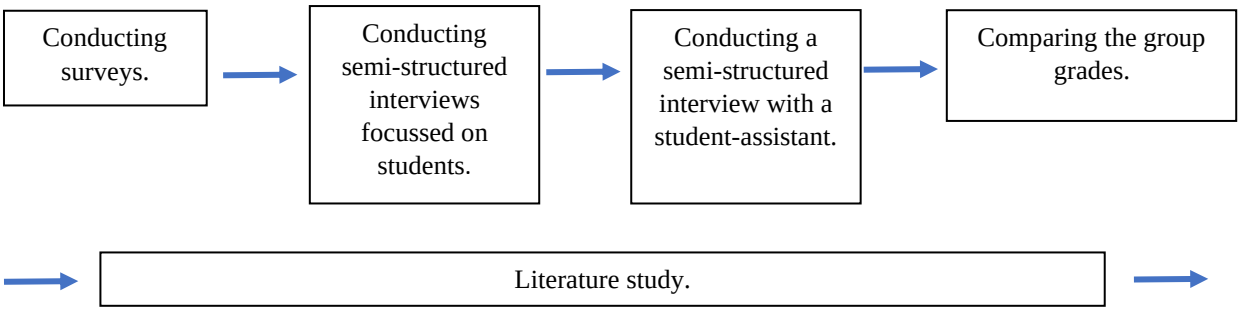


Figure 13: Quantitative data collection agenda.

3.2.2.1. Quantitative data

The questionnaire is analysed with statistical tests. This research employs three different kinds of statistical tests. The first test is used to identify whether there is a difference in creativity between students working in GatherTown (group 1) AND students working in both GatherTown and the physical Spatial Design Atelier (group 2). The second test focussed on the level of satisfaction of group 1 and 2 and working in GatherTown. The last statistical test analysed the grades group 1 and 2 received for both the mid-term and the final assignment. The questionnaire questions can be found in table 7.

Table 7: Questionnaire focussed on the students, questions, level of measurement and the answer options.

Question	Level of measurement	Options to answer
1. In which group are you enrolled?	Nominal.	12 hours per week in GatherTown, 8 hours per week in GatherTown and 4 at the campus, 4 hours per week in GatherTown and 8 at the campus.
2. I would rather be (more) active at the campus during the SD3 course.	Nominal.	Yes, No.
3. I enjoy group projects.	Ordinal.	Strongly disagree, Disagree, Neutral, Agree, Strongly agree. (Likert-scale).
4. I felt comfortable with my team.	Ordinal.	Likert-scale.
5. My group is supportive of thinking out of the box.	Ordinal.	Likert-scale.
6. Even though I made mistakes during the creation of our product I used those mistakes as an opportunity to grow.	Ordinal.	Likert-scale.
7. The supervisor was accessible and comfortable to contact.	Ordinal.	Likert-scale.
8. The supervisors created a professional working environment.	Ordinal.	Likert-scale.
9. Most of my team members and I were even before the project started good friends/ acquaintances.	Ordinal.	Likert-scale.
10. When creating our product (the posters) our group has used a wide variety of sources.	Ordinal.	Likert-scale.

11. Our group has experienced an aha-erlebnis (a sudden insight/eye-opener/Eureka moment).	Ordinal.	Likert-scale.
12. It was clear who was responsible for which part of the assignment.	Ordinal.	Likert-scale.
13. We spend more time around the table discussing and communicating than working individually.	Ordinal.	Likert-scale.
14. I believe that our group delivered an innovative valuable product.	Ordinal.	Likert-scale.
15. I believe that our group delivered an original/surprising product.	Ordinal.	Likert-scale.
16. The product is a collective group afford instead of individual parts tied together.	Ordinal.	Likert-scale.
17. What grade would I give working in the GatherTown environment.	Ratio.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10.
18. What grade would I give working on the campus in the Design Atelier (*only applicable to students who did work in this environment).	Ratio.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10.
19. What were the two positive aspects of this Atelier? What was particularly well done? In other words, next time what shall we absolutely keep from the current version?	Open question.	Open question.
20. What were the negative aspects of this Atelier? What could be better organised or executed in this course, what should or can we improve?	Open question.	Open question.

Regarding analysing creativity between the two groups, it is important to explicate the statistical construction. This research combines multiple questions instead of analysing all individually. This is done to get a stronger, comprehensive result instead of getting more individual and scattered results. To compare the two groups of students, step one is identifying the type of question. This research tries to determine whether there is a difference between the two observed groups. The two observed groups (group 1 and group 2) are the two independent variables. The dependent variable is (measured over multiple questions) creativity. The type of data is ordinal data (a Likert-scale). A non-parametric test is required because this is ordinal data in combination with a sample size which is too small (15 & 17). Therefore, given all information, the Mann-Whitney U test is the best statistical test to use (De Winter & Dodou, 2010). At least, this is the case when analysing single questions. Ultimately, the two distributions of ordinal data are compared to determine whether there is a significant difference between the distributions. The downside of using this test is that it will only show whether one group responded significantly differently for that specific question. When this test would be used for most questions, we would have a lot of different test results but no clear way to show how they link. However, as is discussed and justified in the conceptual model, creativity is the underlying construct (latent variable) tying together all individual questions. Therefore, one needs to find a way to aggregate the response variables into one dependent variable, creativity. Normally, Likert scale data cannot be aggregated. This is due to the fact that it is not always clear that the difference between for example a 1 and 2 is the same as the difference between a 2 and 3. In order words, the numbers aren't well-defined numeric properties. Fortunately, there are situations, including specific circumstances, which give us reasonable ground for appropriately aggregating Likert-scale data. An important requirement in order for this condition to hold is that the survey exhibits internal consistency. There are a few ways to verify whether this condition actually holds. One method is the Cronbach's alpha test. This test is used to see whether each question correlates with all the other questions. In other words, when someone answers a 5 for one item, the test will check whether answering 5 (high creativity) correlates with answering a 5 on the other questions, and so on and so forth for all other comparisons. Due to the theoretical justification provided in chapter 2, it is appropriate to suggest that the internal consistency of the survey's result can be measured with the use of Cronbach's alpha. This is since it is supposed that multiple items combined do measure creativity. These items are question 3 until question 16. By way of explanation, when the correlation of the variables between each other is high, it gives reasonable grounds for supposing that the survey items as a whole measure a single unidimensional construct.

The data showed whether this internal consistency is present by giving a value between 0 and 1. When comparing groups, the rule of thumb is that the α value is regarded as satisfactory when it is higher than 0.7, although sometimes it it as high as 0.8 (Bland & Altman, 1997). The reliability results table (8) shows the actual value for Cronbach's alpha. From this table, we can read that the Cronbach's alpha is 0.829, which indicates there is a high level of internal consistency within this specific example. However, from the Item-Total results table (appendix F), we can witness that question 12 has a very low corrected item total correlation, namely 0.045. Therefore, this variable will be deleted from the matrix to improve Cronbach's alpha. After recalculating the data without question 12, the following Cronbach's alpha appeared: 0.843 (table 9). This result indicates an even higher level of internal consistency.

Table 8: Cronbach's alpha after recalculation.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,829	,837	14

Table 9: Cronbach's alpha after recalculation.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,843	,853	13

Since we have the result of the Cronbach's alpha, and because of the fact that it indicates an internal consistency between the 13 dependent variables, there are defensible grounds for aggregating together the 13 dependent variables into one. The next step was to find the arithmetic mean of each row (student). This will give one single number, representing a respondent's average value on how they answered all 13 Likert-scale questions. One could now think of vector v as representing a respondents' 'creativity' score. Since we have the arithmetic mean of each participant (as a vector), this vector is placed in a new matrix together with the column for Q1. This new matrix therefore has two columns: firstly, the column with the values of Q1 indicating in which group the participants were, and secondly the mean score for creativity. Two groups represented the distributions of ratio data, the next step was to investigate whether we can perform a t-test or its non-parametric alternative can be applied. Applying the Shapiro-Wilkinson test of normality for each group of creative scores, one will find that in both cases the p value is > 0.05 (see table 10). The null hypothesis of the Shapiro-Wilk test states that the data is normally distributed. Because of this p value, we accept the null hypothesis, stating that the data is normally distributed, hence the normality assumption holds. Checking the variance of each group (appendix G), one will find them to be unequal. Therefore, a parametric test can be used because normality holds but the standard (student's) t-test cannot be used due to unequal variance between the two groups. As an alternative the Welch two samples t-test must be used since two independent groups are compared.

Table 10: A test of normality run on the average creativity mean of students working in group A and group B.

Tests of Normality

	In which group are you enrolled?	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
avr_pstudent	12 hours per week in GatherTown	,157	15	,200*	,975	15	,928
	3	,164	17	,200*	,964	17	,715

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

**group 12 hours per week in GatherTown equals group 1.

*** 3 = group 4 hours per week in GatherTown and 8 on Campus and equals group 2.

The survey has gathered data in Qualtrics. After the gathering, the data was exported into SPSS to analyse. After removing the incomplete responses, the data have been analysed with various statistical tests. The first as is announced and justified above is the Welch two samples t-test. The use of the other tests are more elaborated on in the findings.

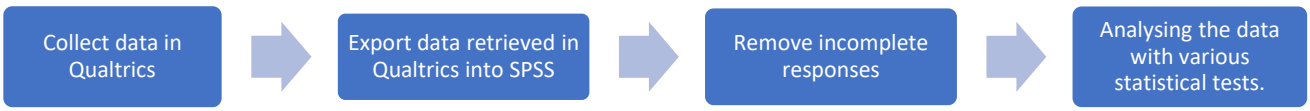


Figure 14: Qualitative data processing agenda.

3.2.2.2. Qualitative data

Regarding the semi-structured interviews, the interviewer carefully selected and prepared a list with questions. The design of a semi-structured interview has been chosen in order to guide along the lines of what the participant ought to be important (Longhurst, 2016). Open interviews, on the other hand, are not suitable since a specific scope for the interview is necessary (Clifford et al. 2016). The interviews are analysed and transcribed with the help of Atlas.ti. Then, the most important quotes were selected and set forth in matrixes (Appendix E). As it goes without saying, the differences between students and the student-assistant replies have been carefully weighed and analysed. Also, it has been asked to record the interview in order for the interviewer to carefully analyse the interview afterwards.

Figure 15: Quantitative data collection agenda.

The students and student-assistant interviewed are shown in figure 11. A careful distribution of students from various groups have been made, as well as a relatively equal distribution between men (5) and women (3). Also, the distribution of internationals (4) and native Dutch (4) is fairly distributed. Participants could choose to be interviewed in Dutch or English, whichever was preferential. The Dutch interviews are consequently translated. The transcriptions of all interviews are sent to the interviewee to give written consent. All participants gave consent and stated that the transcriptions reflect what they said. Because of the COVID-19 pandemic, the interviews were held online. All participants agreed to turn on their camera. This was indispensable to observe the non-verbal communication.

Table 11: Overview of the interviewees.

Date of the interview	**Group**	**Participant**
22-04-2021	A	Sonia *Student*
06-05-2021	A	Lilia *Student*
21-04-2021	B	Bart *Student*
22-04-2021	C	Hanna *Student*

22-04-2021	C	Harmen *Student*
22-04-2021	D	Valentijn *Student*
28-04-2021	D	Luuk *Student*
06-05-2021	-	Victor *Student assistant*

3.2.2.3. Qualitative and quantitative data combined

The survey questions (quantitative data) and the semi-structured interview questions have been based on literature. Additionally, after a quick analysis, the interview questions have been established. Table 12 gives an overview of the relationships between the various types of data collection, theory and questions.

Table 12: Combination of quantitative data, qualitative data and theory.

Category	**Survey Question**	**Follow-up question(s) interview**	**Hypotheses**	**Based on/inspired by**
Pre-conditions				
1	In which group are you enrolled?			
2	I would rather be (more) active at the campus during the SD3 course.			
3	I enjoy group projects	What exactly do you (not) like? Did you feel enthusiastic about the assignment?	Higher individual motivation correlates to higher individual creativity.	Bakker & Xanthopoulou, 2013; Černevičiūtė & Strazdas, 2018; Hennessey, 2004; Mao et al., 2020.
The environment				
4	I felt comfortable with my team		Psychological safety as a supportive work climate fosters team creativity.	Bouckenooghe & Menguc, 2018; Edmondson, 1999; Hakanen et al., 2008; Mayfield & Mayfield, 2010; Zhang et al., 2010.
5	My group is supportive of thinking out of the box		The more openness as team has towards ideas, the more satisfied and productive this team will be.	Bouckenooghe & Menguc, 2018; Černevičiūtė & Strazdas, 2018.
6	Even though I made mistakes during the creation of our product, I used those mistakes as an opportunity to grow.		Teams working in a supportive work environment and teams who are eager to learn from experiences and mistakes will foster team satisfaction, creativity and productivity.	Bouckenooghe & Menguc, 2018; Brookhart, 2013; Černevičiūtė & Strazdas, 2018.

7	The supervisor was accessible and comfortable to contact	How were your interactions with the supervisors?	The better the relation with a trustworthy peer, the more team creativity can be generated.	Bouckenooghe & Menguc, 2018; Mao et al., 2020.
8	The supervisors created a professional working environment	Did you feel that the platform changed the way of interaction with the teachers?	A professional peer will stabilise team synergy.	Mao et al., 2020; Vincent-Lancrin et al., 2019.
The process				
9	Most of my team members and I were even before the project started good friends/ acquaintances	Our team took a considerable amount of time to get to know each other before we started the group project	Teams with more trustworthy relationships (like friends) within a team will lower barriers for sharing knowledge which is in itself a source to unleash creativity.	Renzi, 2008.
10	When creating our product (the posters) our group has used a wide variety of sources		Sharing resources, sources and information in a team will be beneficial to individual creativity.	Brookhart, 2013; Černevičiūtė & Strazdas, 2018; Park et al., 2020.
11	Our group has experienced an aha-erlebnis (a sudden insight/eye-opener/Eureka moment)	When were these moments? Can you tell me what triggered these moments?		
12	It was clear who was responsible for which part of the assignment	Did you trust your team members to deliver on the assigned tasks? What can you tell me about the task distribution? How do you feel about this division?	Coordinated teams in collaborative activities with equally mutually involved team members will be better able to solve problems.	Cross & Cross, 1995; Hamalainen, 2008; Park et al., 2020; Rodríguez-Sánchez et al., 2017; Zhang, et al. 2019.
13	We spend more time around the table discussing and communicating then working individually	What do you think about the ratio between working individually and discussing collectively? Would you change anything next time?	Being able to share and explain new ideas as an individual will create more individual creativity comparted to individuals who are not able to share and express their ideas.	Streicher et al., 2012.
The product				
14	I believe that our group delivered an innovative valuable product	How satisfied are you with your end product?	It is interesting to compare an individual's self-assessment compared to actual grades.	Amabile, 1996; Boden, 2004; Kelley & Kelley, 2014; Oldham & Cummings, 1996; Park et al., 2020; Perkins, 1981; Ritter et al., 2012; Sawyer, 2006; West,

				2002; Woodman et al., 1993.
15	I believe that our group delivered an original/surprising product.	What could have been improved?	It is interesting to compare an individual's self-assessment compared to actual grades.	Amabile, 1996; Boden, 2004; Kelley & Kelley, 2014; Oldham & Cummings, 1996; Park et al., 2020; Perkins, 1981; Ritter et al., 2012; Sawyer, 2006; West, 2002; Woodman et al., 1993.
16	The product is a collective group afford instead of individual parts tied together	Was this a strength or a weakness of your group? Why do you think so?	Cohesive teams with collective task engagement will increase their creative tasks.	Hamalainen, 2008; Kirkman et al., 2004; Rodríguez-Sánchez et al., 2017.
<u>The platform</u>				
17	What grade would you give working in the GatherTown environment	How do you feel about the 'face-to-face contact'? Was it easy to communicate with your team members Was it easy to communicate with your supervisors?		
18	What grade would you give working on the campus in the Design Atelier (*only applicable to students who did work in this environment)	To what extent did the platform influence the team performance? If you could compare, what are the main strengths and weaknesses of the two platforms. If you could compare once more, what platform do you prefer Is the other platform a good alternative?		
19	What were the two positive aspects of this Atelier? What was particularly well done? In other words, next time what shall we absolutely keep from the current version?			
20	What were the negative aspects of this Atelier? What could be better organised or executed in			

	this course, what should or can we improve?			

3.3. Reliability and validity

Clearly, when interviewing a smaller number of individuals, it is hard to make general statements about the whole population. These results will not provide a hundred percent, perfect, holistic overview of certainty regarding all individuals involved. Therefore, this research will establish a specific insight (Adams, 2015). However, by taking into account a fair distribution of all groups involved, this limitation can be limited. As well as taking into account a fair distribution of men/women ratio and national/international ratio. This process is well-established and will therefore give more reliable results. The way of selecting individuals is designed to be as fair as possible. 16 random individuals were contacted, four of each subgroup (A, B, C, D). Although from the first 16 emails, no interview was conducted. It took eventually four email sessions of 16 emails each to reach eight participants. Therefore, a slight bias could exist of individuals who wanted to talk about the topic because they were either extremely positive or extremely negative. In the best case-scenario, the 16 individuals from the first emails would have agreed to participate. However, a social research is almost always biased, you cannot force participants to join. In terms of validity, it would have been best if one more participant from group B would have joined. Although, even though the fact that only a limited number of the population is interviewed, around 20% of the population filled in the survey. The fact that this research employs mixed methods and triangulation increases the validity (Tyrrell, 2016).

One has to keep in mind that by not randomly assigning students, a bias could exist which could in its turn influence the results. This is to say that students could have a preference upfront and could therefore be less or more motivated depending on if they gained their preferred choice. In other words, students had the opportunity to choose whether they wanted hybrid or fully online education. This registration worked with a full-is-full system. Due to the COVID-19 virus, social contact is scarce, and many students value seeing each other in real life, causing the groups to be full within no time. On the other hand, online education offered a solution to students who were trapped in foreign countries due to the regulations in response to the COVID-19 pandemic.

Also, because this is a case study, an in-depth analysis can be made. In addition, the outcomes of this specific research can be a stepping-stone in future research regarding online education, GatherTown and the importance of face-to-face communication. Due to the COVID-19 pandemic, the interviews had to be held online, with a camera to observe the non-verbal communication aspects. Rather than this, the pandemic did not increase or decrease the validity or reliability of the project. Quite the contrary, without the COVID-19 pandemic this research could not have been performed due to the lack of an incentive to shift the SD3 Course into the online environment of GatherTown.

3.4 Ethical considerations

The last part of the research design involves ethical issues and is crucial for the final decisions (Clifford et al., 2016). Before the interview started, the interviewer asked the participant for consent regarding recording the conservation. In addition, the scientific aim and educational purpose of the research were explained. Also, the interviewer stated that withdrawing from the research is possible at any point. All data is stored on a password containing computer. The participants were aware of the fact that this research does not have a political or commercial interest and that the research can be seen as objective.

3.4.1 Privacy

Privacy is guaranteed as much as possible. This is partly due to the fact that participants will unconsciously share more information when privacy is well secured (Hay, 2010). The quantitative data collection through a survey did not require a name, students only had to fill in their overarching group (A/B, C or D) consisting of 35-70 individuals. Regarding the grade analyses, the individual midterm and final grade were analysed without any individual name or group name/number to guarantee full privacy. Group A and B were combined, and so were C and D to create a bigger pool. Students asked to participate in the semi-structured interviews always had the opportunity to decline the offer. Besides this, participants who did agree to participate always had the possibility to ask for a pseudonym. If this happened and which individual(s) this concerns will not be announced. In order to select willing students, a random generator has been used to identify four students of all four groups (A, B, C & D). Those sixteen students have received an email with an invitation. Each student who declined the offer was replaced by another randomly selected student.

3.4.2 Reflection on data collection process

Regarding the quantitative data collection process, not many obstacles have been encountered. Obviously, one would like the sample to be as large as possible, but with a sample of 20% of the population a comprehensive analysis can be made. During the qualitative data collection process, the only pitfall can be the fact that not all individuals replied. Therefore, a slight bias could exist. During the interviews, the participants felt comfortable and answered diversely and versatile. As a response, the interviewer replied with a positive attitude and showed understanding. As a result, at the end of the interview, some participants were interested in seeing the final report.

“Finally, from so little sleeping and so much reading, his brain dried up and he went completely out of his mind.”

(Cervantes Saavedra, 1986).

Nikki Potze – Taboo telling.

4 Results

4.1 Comparing creativity between both groups

4.1.1. A difference in self-assigned creativity scores

The first discussion of result regards checking whether there is a significant difference between group 1 and group 2 and their respective (3.2.2.1.) creativity scores. Checking the variance of each group (appendix G), one will find them to be unequal. Therefore, a parametric test can be applied, as normality holds. The standard (student's) t-test cannot be used due to unequal variance between the two groups. As an alternative the Welch two samples t-test must be used since two independent groups are to be compared. The null-hypothesis of this test is: 'the creativity score mean is equal for group 1 and group 2'. Students who had hybrid class (group 2) had a higher creative mean (M = 4,13, SD = 0,47) than those that had online class through GatherTown (M = 3,47, SD = 0,43), t(29,952) = 4.114, p = 0.000280. Therefore, we can reject the null-hypothesis and state that there is a significant difference between the two groups. One has to keep in mind that students have filled these creativity scores in themselves. In other words, the test results show that there are reasonable grounds for students in group 2 to believe that they acted more creative in this course than students in group 1.

Table 13: Group Statistics of the average creativity scores of students in group 1 & 2.

Group Statistics

	In which group are you enrolled?	N	Mean	Std. Deviation	Std. Error Mean
avr_pstudent	12 hours per week in GatherTown	15	3,4718	,43013	,11106
	3	17	4,1267	,47022	,11405

Table 14: The Welch Two Sample T Test on the average creativity scores of students in group 1 & 2.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
avr_pstudent	Equal variances assumed	,085	,772	-4,090	30	,000	-,65490	,16010	-,98188	-,32793
	Equal variances not assumed			-4,114	29,952	,000	-,65490	,15919	-,98003	-,32978

4.1.2 The grades given to both groups.

Next follows comparing group grades between group 1 and group 2. Both groups have results for a mid-term test and a final test. It is important to mention that each group had a different supervisor, which could influence the grades. However, the supervisors have compared each other's grades (sample) and assistant-supervisors have joined grading two groups causing calibration. When comparing groups, we have two equal sample sizes (group 1 & 2), and we have interval data in the form of grades. We have two grades, one of the mid-term and one of the final assignment. Therefore, we will check whether the assumptions for a parametric test hold. First of all, the data is independent. After doing tests of normality, we can conclude that both the Kolmogorov-Smirnov and the Shapiro-Wilk indicate that the data is not normally distributed.

Table 15: Tests of normality for team assignment 1 and 2.

Tests of Normality

	Group	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
Team assignment 1	1	,133	71	,003	,910	71	,000
	2	,201	70	,000	,920	70	,000
Team assignment 2	1	,215	71	,000	,872	71	,000
	2	,179	70	,000	,895	70	,000

a. Lilliefors Significance Correction

Therefore, the Man-Whitney U test is the right test to employ. Firstly, the first teams assignment is analysed. The null-hypothesis of this test is that: 'group 1 & 2 have an equal mean rank for the first team assignment'. When applying the Mann-Whitney U test we find that there is no significant difference between group 1 and group 2 regarding team assignment 1. Students from group 1 had the same mean rank (M = 12.64, SD = 2.94) as students from group 2 (M = 13.11, SD = 3.11), t(140), p = .238. Therefore, we accept the null-hypothesis of equal mean rank.

For the second assignment the null-hypothesis is: 'group 1 & 2 have an equal mean rank for the grades of the final team assignment'. For the final team assignment we see a different result. Here we find that there is a statistically significant difference between students from group 1 and group 2. Students from group 2 had a higher mean rank (M = 28.57, SD = 3.09) than students from group 1 (M = 22.85, SD = 5.81), t(140), p = 2.73E-11. Therefore, we reject the null-hypothesis of equal mean rank in regard to the grades. We can conclude that group 2 has a higher equal mean rank grade than group 1. As is proven in previous research, dropout rates of online education compared to physical education are higher (Murphy & Kenner, 2016; Patterson & McFadden, 2009). This research suggests on terms of reasonable grounds, that the fully online group has statistically significant lower grades for the final assignment.

Table 16: Mann-Whitney statistic for assignment 1 and 2.

Test Statistics[a]

	Team assignment 1	Team assignment 2
Mann-Whitney U	2200,000	887,500
Wilcoxon W	4756,000	3443,500
Z	-1,181	-6,660
Asymp. Sig. (2-tailed)	,238	,000

a. Grouping Variable: Group

4.1.3 Advantages of GatherTown

Throughout the interviews, both positive and negative aspects of the GatherTown environment came to light. This qualitative data might help to explain why there is a difference in creativity between the two groups. Before diving into the features students did not like, let's first evaluate what students liked. In figure 16, the four main advantages raised by the interviewees are displayed. Next to the boxes, one can find a quote. Under the category, one can find numbers that relate to similar quotes which can be found in appendix A. This way, these examples are not merely cherry-picked, but back each example up by showing that there are additional quotes of similar nature. During the interviews, more of these categories were implicitly mentioned, they served as a lot of inspiration. The numbers are merely related to quotes that explicitly state something equal. To summarise, the students valued the visual aspect of GatherTown, the possibility of having one-on-one conversations, the possibility to come together, and the accessibility to the teachers the most.

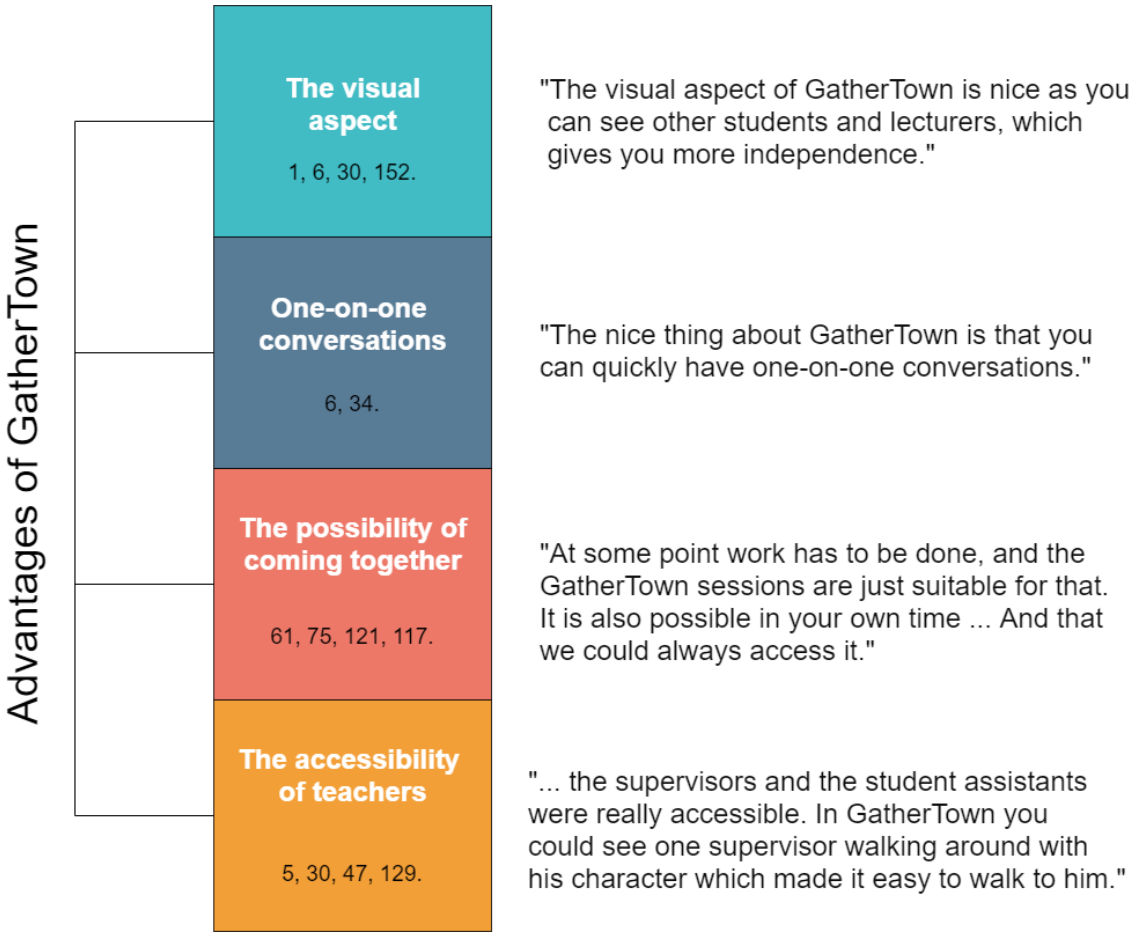


Figure 16: Visualisation of advantages of GatherTown, the numbers stand for individual quotes which can be found in Appendix E.

One of the great advantages of GatherTown according to students is the visual feature. This is to say, that you as an individual can walk around in a 2D map and see other individuals (GatherTown, 2020a). Additionally, a bubble will pop up showing when another character is communicating. Also, the characters make it possible to observe when someone is alone. Therefore, the avatars and bubbles give more clarity about when to approach someone. All in all, it makes it more 'natural' to make conversation with another individual, and walk into other groups. This is to say that people feel more comfortable making conversations.

One-on-one conversations are mentioned as a positive feature in GatherTown by the students. In a physical environment, the importance of one-on-one conversations is already known (Appel – Meulenbroek et al., 2017; Jansz et al., 2020). Although many interviewees named this aspect implicitly, two students named the advantage explicitly. One of them, who enjoyed fully online education, described that it is nice to have the possibility of one-on-one conversations. Especially with the above-mentioned visual aspect. Both features combined make it more natural to talk to other individuals. However, one interviewee who followed hybrid class, makes a comment. According to her, although the fact that it is nice to have the possibility of one-on-one conversations, not many hybrid groups made use of it. Rather, they would call each other directly through another platform like WhatsApp. It is interesting to see that the hybrid group used one-on-one conversations differently than groups who worked fully online. The fully online students seem to enjoy the feature and state that they made good use of it.

There is a direct link from the visual feature to the accessibility of teachers. Because groups can see when a supervisor is alone, it makes it easier to approach the supervisor. Most interviewees found the contact with the supervisors both on GatherTown and in the physical Atelier highly favorable. Most interviewed students found the supervisors to have a high amount of availability, although one student

stated that she had to wait a long time for the supervisors to reach their room. The student-assistant however, did not find the contact optimal. He states that he felt detached in GatherTown, since students did not raise many questions. He also stated, which is confirmed by other students, that he walked around the rooms to ask if there were any questions. Adding to this, one student claimed that the student-assistants were easier to contact in the physical Atelier whilst the supervisors were easier to contact in GatherTown. Most students found the accessibility with the supervisors good, which could eventually influence the creative outcome positively (Bouckenooghe & Menguc, 2018; Vincent-Lancrin et al., 2019). However, to compare, the relationship with the supervisors in the physical Atelier were also as good. Therefore, it is expected to make not much of a difference when comparing the creative outcome of both platforms.

Lastly, students raised the utility of GatherTown as an online platform. Coming together without a restricted place or time was optimal for the students. GatherTown was always accessible, in line with the findings of Bonk & Khoo (2014), stating that the advantage of the online environment is the lack of a physical space. Coming together as a team gives freedom and independence. For example, to finish work in your own time. From an international perspective placed in the COVID-19 pandemic, students valued having the opportunity to study online in the GatherTown environment.

4.1.4 Disadvantages of GatherTown

After having examined the major advantages of GatherTown, it is now time to evaluate the disadvantages. Four disadvantages are interrelated on a social level. Formality in relation with missing out on moments of joint leisure and feeling less responsible were some disadvantages found. The other major disadvantage is still partly social but also has a technical component. This is the poor ability to share ideas at GatherTown.

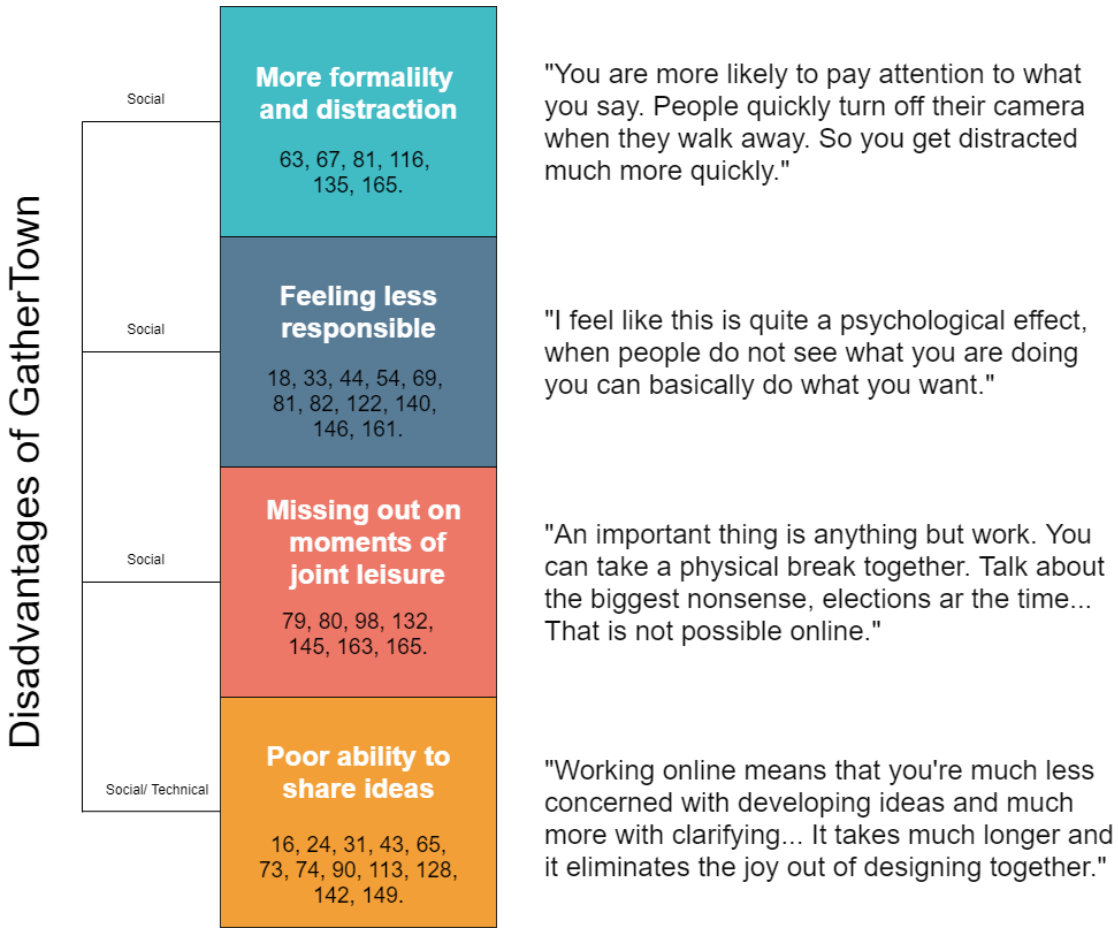


Figure 17: Visualisation of disadvantages of GatherTown, the numbers stand for individual quotes which can be found in Appendix E.

The interviewees felt that acting in the GatherTown environment made the interaction between group members and other students more formal. Some students felt like they had to watch their words because in an online environment a conversation can be easily recorded. Therefore, they paid more attention to what they said, making the conversations more formal. According to Han et al., (2017), an online environment is always more prone to distrust. Unlike the physical Design Atelier, the groups had designated rooms in GatherTown. Although there was no door, the students were surrounded by walls. According to some students, the design of this Atelier caused them to feel like they were in a more formal setting. This made, unlike the point about the visual characteristics of GatherTown, it hard for students to visit other groups. Also, a lot of students indicated that a lot of other students never turned their microphone or camera on. Especially at the beginning of the process, it was quite unclear whether or not this was asked from them. Some groups did have their camera on but turned them off when they went away for a break. According to the interviewees, this caused a lot of distraction. Besides this, many students registered that in an online environment, it is way easier to get distracted in the first place. This confirms Hartnett's (2016) theory, relating to lesser motivation in an online environment.

Closely related to formality and distraction is the point of feeling less responsibility and approachability. Students indicate that it is hard to check on others. Because you feel less pressure, you get distracted more easily, and also the word "lazy" is mentioned. In addition, students also feel less addressed in an online environment. To put it the other way around, when asking a question to someone else they might not reply as easily. Due to the fact that you cannot look someone in the eye. Also, in an online environment, it is easier to postpone work. Because of the reason that you can always meet, there is less time pressure.

The last linked socially negative aspect of GatherTown is missing out on joint moments of leisure. Students working in a hybrid environment realised the importance of breaks. Talking about something else than the work, a more informal conversation. Whether this was done by the smokers outside or by a group grabbing lunch. It seemed important to get out of a loop of thought. In the online environment, these joint leisure moments did not happen. Often one would switch off their camera and mic and get a coffee. This is also due to the fact that students' eyes got tired when looking at the computer screen the whole day. Therefore, the incentive to do something else increased. In the online environment there was sometimes a slight start of an informal conversation in the early morning, but not during breaks. The interviewed student-assistant supported a special 'break' room in which students could meet to talk about something else than the project. This can be beneficial since students were mainly active in their designated project room. Also, he emphasized the importance of mentioning the importance and availability of this break room by the supervisors. This confirms the importance of campuses acting as third spaces (Jansz et al., 2020). In the physical Design Atelier, a clear use of the campus as a meeting ground including shared facilities is seen. This helps in building trust, which might be one of the explaining factors of why there is a difference in the students' creativity (Curvelo Magdaniel, 2016). This function of a campus was lacking in the online environment.

Technically, the main problem was sketching together. This was, compared to the physical class, not possible. Sketching online in the GatherTown environment was hard. Instead, people had to share their screens, which took way longer:

> "Thinking and quickly sketching a few lines takes three minutes digitally, while with a marker it only costs five seconds." (24)

Students who followed hybrid class could compare their work and stated that sketching physically was indeed easier. In the online environment, one is more concerned with clarifying than designing. The social aspect of communicating is crucial (Hadzigeorgiou et al., 2012), but hard in the online environment. It is harder to express yourself and one has to be aware about interrupting each other. Something which according to the students is accomplished more smoothly in a physical setting. As a consequence, sharing ideas online turns out to be less joyful. Observed in traditional online environments, also GatherTown does face technological difficulties (Han et al., 2017). Ultimately, a joint creative outcome is partly due to the ability to communicate effectively and be able to share knowledge (Park et al., 2020; Renzi, 2008; Zhang et al., 2019). To summarize, the four disadvantages of GatherTown show that communicating and discussing is not immaculate.

4.2 Team dynamic

The group dynamic is relatively equal on both GatherTown and the physical Design Atelier. Of all interviewed students, there were two students who did not like their group dynamic. One student was in a fully online group and the other student was in a hybrid group. The individual in the fully online group stated that he had tried to get to know his group members, but it remained mostly quiet. In addition, both individuals stated that they like group projects depending on their team. Unfortunately, on both platforms, this did not work out. The individual in the physical Design Atelier knew all group members relatively well and worked together with one of his good friends. Also, interviewees with a positive group dynamic used different approaches regarding getting to know their team members. Some took a considerable amount of time to get to know their group members. Others (both hybrid and fully online) jumped right into the project and got to know their members during the project. Although, all interviewees agreed that getting to know other team members is crucial in an effective and creative group dynamic.

Regarding work division, it was clear that both in the GatherTown environment and the physical Design Atelier, only one person was in charge of the poster design. This is since most posters were made in Adobe software, so only an individual could work on the poster on their computer. On both platforms, the teams helped to create and evaluate the outline of the poster. The hybrid teams mostly discussed in the physical Design Atelier because it was more effective. They used GahterTown to work on individual parts, which they caught up on at a plenary meeting after a specified amount of time.

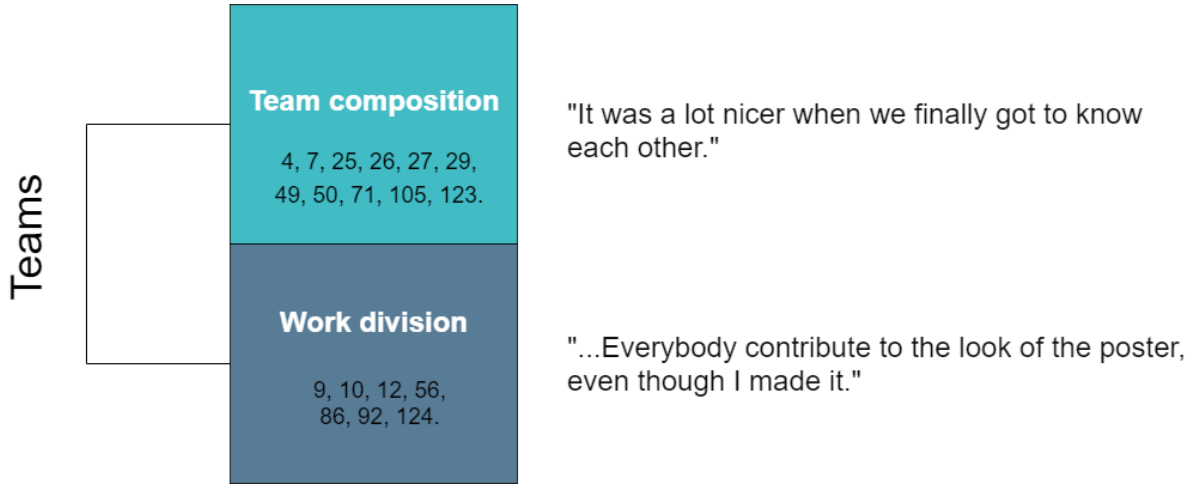


Figure 18: Visualisation of team composition and work division, the numbers stand for individual quotes which can be found in Appendix E.

In GatherTown, students did not often reach out to other teams. The first reason is the fact that it is more impersonal, as you do not see someone's body language when approaching another group. The second reason is that the tables are enclosed within walls, making it harder to walk around freely and start a conversation. This second reason is mainly seen by the student-assistant. Also, both reasons link back to groups switching off their cameras and microphones. Hiding in an online environment is easy. In GatherTown, the supervisors did stimulate people to walk around and talk to other groups, one interviewee mentioned. Still, this rarely happened. Besides the online 'walls', another difference between the online and physical platforms is the fact that in the physical setting, groups would have their old posters next to them. Every week, groups would give short poster presentations, to update the rest of the groups on how far along they are, and to ask for feedback. These posters were in the physical environment placed next to the groups. According to the student-assistant, this was an incentive for other groups to start a conversation and interchange ideas. Team dynamic can also be seen in relation to the difference in grades. More specifically, the mid-term grades were equal whilst the final grade separated the two groups. One of the possible explanations in line with communication is that the physical team had time to form a well-functioning team dynamic. Rodríquez-Sánchez et al., (2017) already explained

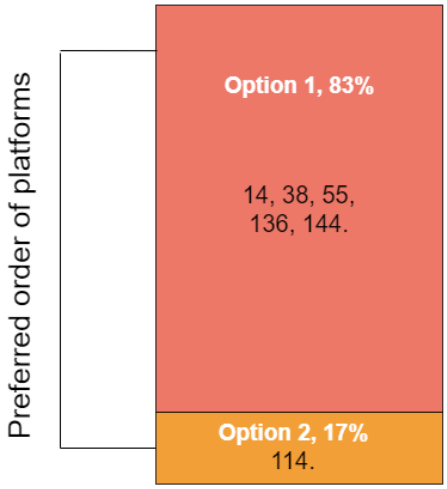
that collaborate teams with mutual involvement are better in problem solving. Moreover, one of the micro factors as is elucidated by Černevičiūtė & Strazdas (2018), is that the unity of a team is very important. Although there is no direct link to the 'unity of a team' as the decisive factor for the change in group grades, it is suspected to be. All four main disadvantage are a hindrance to forming a well-functioning team dynamic.

4.3 Preference of platform

In terms of hierarchy, all students and the student-assistant agreed that it is best to work together physically. Although there are advantages to online platforms when being geographically scattered, the physical setting is definitely first. Five interviewees explicitly stated that they prefer the physical Design Atelier above all, but preferred GatherTown over traditional online platforms (option 1). One interviewee disagreed and preferred the traditional online platforms over GatherTown (option 2).

Option 1.
1. Physical Design Atelier
2. GatherTown
3. Other online platforms

Option 2.
1. Physical Design Atelier
2. Other online platforms
3. GatherTown



"Compared to a Google Meet or a Microsoft Teams it is certainly much better (GatherTown). But for these kinds of projects it is just always a hundred times better to get together physically."

"We used Google Meet and Collaborate because we were already familiar with it, it is just easier. GatherTown is new after all, so I didn't really know how it works."

Figure 19: Preferred order of platforms, the numbers stand for individual quotes which can be found in Appendix E.

Most interviewees choose the physical Design Atelier to be preferential due to the earlier described disadvantages of GatherTown. However, the advantages of GatherTown lead to the result of preferring GatherTown over other online platforms like Google Meet, Collaborate or Microsoft Teams. Students who followed hybrid classes could compare both platforms. They all agreed that the real-life situation is better due to less social inconveniences. Only, a nuance has to be made. A few interviewees did mention that they liked the combination of working one day physically and another day online. According to the interviewees, they divided the tasks. When working physically, they would mostly design together. Online, they would work mostly alone and shared their progress every now and then. Keeping in mind the main disadvantages, this behaviour makes sense. This is since one of the findings is, that working collectively and building a better team dynamic can be best achieved in a physical situation. The advantages of GatherTown do on the other hand stimulate to come together every now and then. Statistically, the mean result of satisfaction regarding GatherTown is 6.03. The mean statistic of satisfaction regarding the physical Design Atelier is 9.12.

Table 17: Descriptive Statistics of question 17 & 18.

Descriptive Statistics

	Mean	Std. Deviation	N
What grade would you give working in the GatherTown environment	6,03	1,750	32
What grade would you give working on the campus in the Design Atelier (*only applicable to students who did work in this environment)	9,12	,857	17

Also, the researcher analysed whether working in GatherTown is perceived differently by both groups. This is done by analysing question 17 'What grade would you give GatherTown?'. Therefore, we run this analysis with two independent groups, and we want to compare the mean of each group. The collected data is interval data and the main question is whether we can apply a parametric test or not. Running the Shapiro-Wilkinson test on question 17 for both group 1 and 2 shows that normality holds for group 1 but not for group 2.

Table 18: Test of normality for question 17.

Tests of Normality

	In which group are you enrolled?	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
What grade would you give working in the GatherTown environment	12 hours per week in GatherTown	,231	15	,031	,914	15	,157
	3	,235	17	,013	,888	17	,042

a. Lilliefors Significance Correction

This result tells us that a Mann-Whitney U test is appropriate to use to make this comparison. The null-hypothesis for this test is: 'question 17 has an equal mean rank for both group 1 and group 2'. When applying the Mann-Whitney U test we find that there is no significant difference between both groups for question 17. Students who took hybrid courses (group B) had the same mean rank (M = 6.35, SD = 1.58) as students that took the course fully online (M = 5.67, SD = 1.92), $t(31)$, p = .176. Therefore, we accept the null-hypothesis of equal mean rank.

Table 19: Mann-Whitney U test for question 17.

Test Statistics[a]

	What grade would you give working in the GatherTown environment
Mann-Whitney U	91,000
Wilcoxon W	211,000
Z	-1,415
Asymp. Sig. (2-tailed)	,157
Exact Sig. [2*(1-tailed Sig.)]	,176[b]

a. Grouping Variable: In which group are you enrolled?

b. Not corrected for ties.

“Just keep swimming.”

(Finding Nemo, 2003)

Matias Salgado – Manifestación en Plaza de Mayo.

5 Conclusion and reflection

5.1 Discussion

Regarding the 'creativity score', a more in-depth analysis could have been employed. Factor analyses or principal component analysis could have been used instead of Cronbach's alpha test. This test will assign structural question modelling which will make the result more precise. Also, the grades received for the mid-term and final do not score merely creativity, as creativity is an overarching interwoven goal. As is discussed in the methodology, most of the learning outcomes and grading assessments are closely related to working in teams in creativity. However, not all outcomes directly relate to creativity. Therefore, this research does not state facts regarding the quantitative analysis, but rather in terms of a reasonable ground.

The first (mid-term) assignment was graded equally. However, a difference is found in the final assignment. One of the potential factors explaining can be the fact that teams received more time to develop in the physical session. Those teams had a better opportunity to form a satisfying group dynamic (Černevičiūtė & Strazdas, 2018). The team apparently has to be able to establish a well-functioning dynamic. This is due to the fact that most groups have the disadvantage of not knowing each other at the beginning. To add, the physical group had the opportunity to enjoy the advantages of a campus. One of which is directly linked to building trust (Jansz et al. ,2020). This phenomenon has also been observed by Renzi, 2008). Therefore, the difference in grades for the final assignment is not merely due to direct causes like a poor ability to share ideas. Indirectly, the group dynamic or the lack thereof seems to influence the results. Well-structured group dynamics are therefore preconditional breeding grounds for creative processes. On the other side, in the online environment this trust is lacking (Han et al., 2017). As one of the five inhibitors to online creative team processes. This might argue from the other side that the physical group had a better opportunity to create a team dynamic whilst the group working fully in GatherTown was lacking this.

5.2 Conclusion

This research aimed to identify how creativity is experienced in the online environment of GatherTown, which is then compared to the same experience in a physical environment. Based on the quantitative data, there is reasonable ground to state that the hybrid group (2) experienced more creativity than the group working fully online (1). Adding to that, students in group 2 perceived themselves as being in a more creative process than students in group 1. The hypothesis of this research, that a physical space will evoke more creativity than a fully online space is accepted. These outcomes can be explained with the help of qualitative data. It can be concluded that the differences in creative outcomes are due to four main reasons:

1. More formality and distraction,
2. Feeling less responsible,
3. Missing out on moments of joint leisure,
4. Poor ability to share ideas.

Expected by Han et al., (2017), in an online environment there is a level of distrust and formality. Even though GatherTown provided one-on-one conversations (GatherTown, 2020a), this feeling could not be fully eliminated. Additionally, students working fully online were also distracted easier (Hartnett, 2016). Hypothetically speaking, due to these one-on-one conversations, GatherTown was expected to stimulate creativity (Appel – Meulenbroek et al., 2017; Hillier & Penn, 1991; Jansz et al., 2020). There is evidence that GatherTown did not perform as well as the physical Atelier regarding creativity. There is, however, no hard evidence about whether the function for one-on-one conversations stimulated more creativity compared to an online platform without this particular function. What can be said, is that students

perceived the function as a positive feature and that the majority prefers GatherTown over other traditional online platforms.

The poor ability to share ideas was expected by Han et al., (2017), as one of the five main inhibitors to online team creativity are technological difficulties. This research confirms that this specific inhibitor is also a disadvantage in GatherTown. In addition to the five main inhibitors, this research also provides two new hindrances. These can be specifically relevant in GatherTown, but future research might also dive into whether traditional online platforms also come across these inhibitors. The first new hindrance is missing out on a moment of joint leisure. Without focussing too much on this aspect in the theoretical framework, this research found that students realise the importance of having joint moments of leisure. Adding to that, the students also felt like these moments were present in physical Atelier, but missing in GatherTown. Third spaces were not reaching full potential online (Jansz et al., 2020). Also, this can be an explaining factor as students in the fully online environment were missing out on trust-building (Curvelo Magdaniel, 2016) in addition to missing out on moments of joint leisure. The second new hindrance is the feeling of a lack of responsibility. Students feel more detached and less involved in the project. The poor ability to share ideas and communicate, might be an explanation of why there is a difference between group 1 and group 2. As communication with joint creative processes is crucial (Hadzigeorgiou et al., 2012), the online environment of GatherTown did not provide an environment as advantageous as the physical atelier. Hence, due to a lack of effective knowledge sharing (Park et al., 2020; Renzi, 2008; Zhang et al., 2019), GatherTown did not resemble a physical setting completely. However, most students enjoyed hybrid education. Working together physically and designing whilst working individually online with meet-ups worked according to some interviewees. Showing that GatherTown might be interesting to use, but perhaps in a different setting or with different purposes. Sketching might not be the prime feature of GatherTown, but it might be interesting to support groups.

This research illustrates that GatherTown is a step in the right direction. This is since the majority of the students prefer GatherTown over traditional online platforms. Based on these conclusions, educational institutions should consider when and if they want to employ online platforms. Specifically, when aiming to work on creative projects. This study has touched upon the social relevance of online education due to the COVID-19 pandemic. As a pioneer study, this research is one of the first papers to address the new environment of GatherTown. Even in a platform where you can have the opportunity to start a one-on-one conversation, creativity is not statistically significant. This can help educational institutions plan future education. Although online environments might be useful for functional purposes, this study also concludes that group processes go beyond functionality only. Interpersonal contact between group members seems crucial for a creative outcome. This study, therefore, helps to guard creativity by stressing the importance of physical classes when aiming for creativity.

5.3 Reflection

Reflecting upon the improvement of the research, the data collection process could have been improved. To reach the seven students, 50 emails were sent, fifteen at a time. The best-case scenario would result in just fifteen emails with an instant reply of at least half of the addressed. The distribution was solid, as three students represented group 1 and four students in group 2. Regarding the quantitative data, 20% of the population replied. This is a big enough result to make statistical inferences. The interviewees seemed comfortable during the interviews. The conversations were informal yet professional. Most of the interviewees were interested in the results of this research, which consequently will be shared with them.

Research partly based on a self-assigned evaluation does have critical aspects. In general, researching social research faces difficulties. The interviewed students are first-year students and therefore do not have much experience to compare. On the other hand, this also means that they have a limited amount of preconceived expectations. The COVID-19 pandemic might have caused a certain 'craving' for physical classes, as most of the students did not follow physical courses that year. Contrarily, many students were also grateful to take the courses online, as they could stay in their home country. Both factors might have influenced their judgment regarding their satisfaction with one of the two platforms. In addition, the grades students received are not an exact representation of pure creativity. More factors are involved in this. Looking with a helicopter view, what do we explicitly know. We know that there is a difference in grades between group 1 and group 2 and that in the interviews all interviewees stated that they prefer the physical environment. We cannot say with 100% certainty that the grades fully represent creativity, but due to our analysis, we state that there are reasonable grounds to believe that there is a statistically significant difference in grades. Adding to that, we have reasonable justification to believe that the social disadvantage of communication and discussion are the main reason for this. That is, including the poor ability to effectively create a well-functioning group dynamic. Also, this research focussed on creativity within education, focussed on spatial planners. It might be, that other sorts of creative group processes like musicians, will gain other uses and outcomes.

5.4 Suggestions for future research

To better understand the connotations of this research, future studies could focus on comparing GatherTown with other traditional online platforms. This research focussed on comparing GatherTown with a physical environment. However, analysing if GatherTown does provide more creative processes compared to traditional platforms due to the possibility of one-on-one conversations might confirm the expectation of an online setting (Appel – Meulenbroek et al., 2017; Hillier & Penn, 1991; Jansz et al., 2020). Future research might also address the two new inhibitors found in online teams (Han et al., 2017). It might be interesting to check those two hindrances against traditional online platforms. It might also be interesting to run the analyses with a factor analysis or principal component analysis to receive a more specific result. As is discussed, the team dynamic or the cohesion of a team might be the most decisive factors to why the grades vary between the two groups. Future research might specifically focus on how team dynamics change and vary between teams.

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Appendix

A. Questionnaire

The questionnaire is sub-divided into five categories: Pre-conditions, the environment, the process, the product and the platform.

Pre-conditions

The first section of the questionnaire is based on nominal data in order to get a profile of the individual students and ordinal data to create a profile of standard conditions regarding groupwork.

Question 1. In which group are you enrolled?

1. 12 hours per week in GatherTown
2. 8 hours per week in GatherTown and 4 at the campus
3. 4 hours per week in GatherTown and 8 at the campus

Question 2. I would rather be (more) active at the campus during the SD3 course.

1. Yes
2. No

Questions 3. I enjoy group projects.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree

The environment

The next category consists of question regarding the environment or external factors. All statements will consist of five answers:

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree

Question 4. I felt comfortable with my team.

Question 5. My group is supportive of thinking out of the box.

Question 6. Even though I made mistakes during the creation of our product I used those mistakes as an opportunity to grow.

Question 7. The supervisor was accessible and comfortable to contact.

Question 8. The supervisors created a professional working environment.

The process

This category asks about statements regarding the group-process. All statements will have five answers:

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree

Question 9. Most of my team members and I were even before the project started good friends/ acquaintances.

Question 10. When creating our product (the posters) our group has used a wide variety of sources.

Question 11. Our group has experienced an aha-erlebnis (a sudden insight/eye-opener/Eureka moment).

Question 12. It was clear who was responsible for which part of the assignment.

Question 13. We spend more time around the table discussing and communicating than working individually.

The product

The pre-last category evaluates the end-product, the posters made for the poster presentation. Again, all statements can be answered through a liker-scale:

1. Strongly disagree
2. Disagree
3. Neutral

4. Agree
5. Strongly agree

Question 14. I believe that our group delivered an innovative valuable product.

Question 15. I believe that our group delivered an original/surprising product.

Question 16. The product is a collective group afford instead of individual parts tied together.

The platform

The pre-last category asks straight to the point the satisfaction with both platforms. Here, the answers can be any number between 1 and 10, whilst question 19 also has the opportunity to answer 'not applicable' for students who did not work on the campus.

Question 17. What grade would I give working in the GatherTown environment.

Question 18. What grade would I give working on the campus in the Design Atelier (*only applicable to students who did work in this environment)

The program

Question 19 and 20 are open questions, to get in inside in the positive and negative sides of the program in general.

Question 19. What were the two positive aspects of this Atelier? What was particularly well done? In other words, next time what shall we absolutely keep from the current version?

Question 20. What were the negative aspects of this Atelier? What could be better organised or executed in this course, what should or can we improve?

Also, two questions from the normal standardised survey, used to evaluate the course will be analysed. The whole standardised survey including results can be found in appendix X. The questions therefore will not be taken-up in the survey designed by the researcher. These questions are:

Statements regarding to online and remote teaching in the course due to the Corona measures

Question 21. There was good communication about the changes in the course.

Question 22. Remote and online teaching worked out well in the course.

B. Semi-structured interview – Students

About the semi-structured interview. On first sight it might look like a long interview however, one has to keep in mind that the – sign is merely stating the survey question on which the interview question is based. This might be used to recall the students attention to the question, but will not be actively discussed. The questions with a dot will be the in-depth questions, functioning as a follow-up question from the questions asked in the survey.

Generally about the assignment (pre-conditions):

- Just to confirm, you were enrolled in group?
- Do you enjoy group projects?
    - What exactly do you (not) like?
    - Did you feel enthusiastic about the assignment?

The environment:

- The supervisor was accessible and comfortable to contact
    - How were your interactions with the supervisors?
- The supervisors created a spontaneous and professional working environment
    - Did you feel that the platform changed the way of interaction with the teachers?

The process:

- Most of my team members and I were even before the project started good friends/ acquaintances
    - Our team took a considerable amount of time to get to know each other before we started the group project
- My group is supportive of thinking out of the box
    - What does creativity entail in your own words
- Our group has experienced an aha-erlebnis (a sudden insight/eye-opener)
    - When were these moments?
    - Can you tell me what triggered these moments?
- It was clear who was responsible for which part of the assignment
    - Did you trust your team members to deliver on the assigned tasks?
    - What can you tell me about the task distribution?
    - How do you feel about this division?
- We spend more time around the table discussing and communicating then working individually
    - What do you think about the ratio between working individually and discussing collectively?
    - Would you change anything next time?

The product:

- I believe that our group delivered an innovative valuable product
    - How satisfied are you with your end product?
- I believe that our group delivered an original/surprising product.
    - What could have been improved?
- The product is a collective group afford instead of individual parts tied together
    - Was this a strength or a weakness of your group?
    - Why do you think so?

The platform

- What grade would I give working in the GatherTown environment
    - How do you feel about the ‘face-to-face contact’?
    - Was it easy to communicate with your team members
    - Was it easy to communicate with your supervisors?
- What grade would I give working on the campus in the Design Atelier (*only applicable to students who did work in this environment
    - To what extent did the platform influence the team performance?
    - If you could compare, what are the main strengths and weaknesses of the two platforms.
    - If you could compare once more, what platform do you prefer
    - Is the other platform a good alternative?

C. Semi-structured interview – Supervisor

This interview has a few basic questions. However, the researcher picked up interesting moments within the interview to continue on these. The conversation naturally flowed without using many standard questions.

Generally about the assignment (pre-conditions):

- How did you experience working online in GatherTown for the first time?

The environment:

- What about the environment was the same, what was different?
    - How did this influence the students

The process:

- Can you explain how the process differed from the process in GatherTown, or was it the same?

The product:

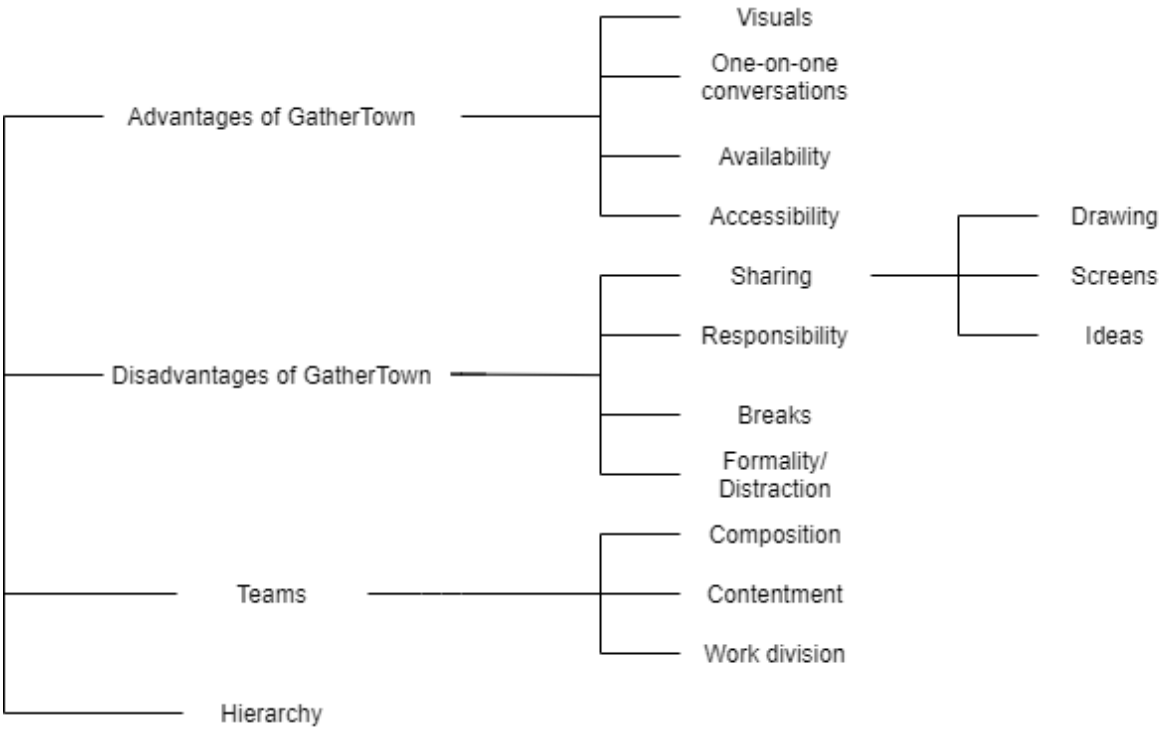
- Are there any differences in the end product?
    - How are these differences possible according to you?

The platform

- What are the biggest differences on both platforms?
- Did you see students taking a break?

D. Code Tree and Code Book.

a. Code Tree



b. Code Book

Codes	Definition	Synonyms	Origin	Importance	Example
Visuals *(Advantages of GatherTown)*	The visual feature of gatherTown as a 2D based platform.	2D, seeing, walking around, bubble.	Deductive (GatherTown, 2020a).	This code will help to explain one of the advantages of GatherTown	"The visual aspect of GatherTown is nice as you can see other students and the lecturers, which gives you more independence" (1).
One-on-one conversations *(Advantages of GatherTown)*	Conversations between individuals.	Communication, opportunity.	Deductive (GatherTown, 2020a; Jansz et al., 2020).	This code is important to gain understanding in one of the advantages of GatherTown	"The nice thing about GatherTown is that you can quickly have one-on-one conversations" (6).
Availability *(Advantages of GatherTown)*	The availability of the online platform of GatherTown as being always accessible.	Coming together, Online, opportunity, time, space	Deductive (Bonk & Khoo (2014; GatherTown, 2020a).	This code is helpful to understand one of the advantages of GatherTown	"And that we could always access it, that when the five or even four of us had time, we could get in quickly" (75).

Accessibility *(Advantages of GatherTown)*	The accessibility of the supervisors within the GatherTown platform.	Lecturers, student-assistents, supervisors.	Deductive (Mao et al., 2020; Vincent-Lancrin et al., 2019).	It will be helpful to analyse this code in order to gain an understanding about one of the advantages of GatherTown	In GatherTown as well as physically, the supervisors and the student assistants were approachable" (47).
Drawing *(Disadvantages of GatherTown, sharing)*	Drawing and sketching physically.	Sketching, making, designing.	Inductive	This code helps analysing the differences between GatherTown and the physical Design Atelier.	"Also when you miss a drawing table, sketching paper and so on. So how do you share your design and your thoughts, through some form of communication." (149).
Screens *(Disadvantages of GatherTown, sharing)*	Sharing screens with other team members.	Sharing.	Deductive (Han et al., 2017).	This code is helpful to distinguish a difference between GatherTown and the physical Design Atelier.	"Then everyone has to share their screens and that gets complicated" (74).
Ideas *(Disadvantages of GatherTown, sharing)*	Sharing ideas through communication and discussion.	Communication, clarifying, opinion, perception, interpretation, discussion.	Deductive (Han et al., 2017).	This code is critical to analyse a difference between GatherTown and the physical Design Atelier.	"I think that in a way, why it is easier to share ideas and brainstorm, which is close to being creativity, in a physical session" (43).
Responsi-bility *(Disadvantages of GatherTown)*	The feeling of responsibility within a specific environment.	Hiding, camera, microphone, accounta-bility, liability.	Inductive	This code is helpful to understand the difference between GatherTown and the physical Design Atelier.	"I do notice that it is a bit safer, it feels much less responsible during an online session" (81).
Breaks *(Disadvantages of GatherTown)*	Taking breaks.	Smoking, food, coffee, talking,	Inductive	This code is important to gain understanding between	"Because we took breaks because our eyes got tired looking at the computer all day, so

		informal, joint.		GatherTown and the physical Design Atelier.	we didn't really want to look at the computer anymore" (132).
Formality /distraction *(Disadvantages of GatherTown)*	The feeling of have distance towards other individuals.	Formal, anonymus, interrup-tion.	Deductive (Han et al., 2017; Hillier & Penn, 1991).	This code will help to establish the difference between GatherTown and the physical Design Atelier.	"People quickly turn off their camera and microphone when they walk away. So you get distracted much more quickly" (63).
Composition *(Teams)*	The extent to how groups are composed. E.g. Do group members know each other?	Team, content, new, friends.	Deductive (Edmondson, 1999; Zhang et al., 2010).	This code will help to understand the group dynamic.	"I knew all of my group members. I knew three of them well, one of whom I knew really well" (29).
Contentment *(Teams)*	How satisfied are individuals with their group members.	Team, depending, group dynamic.	Deductive (Bakker & Xanthopoulou, 2013; Hakanen et al., 2008).	This code is important to understand the group dynamic.	"I do in general like group projects, but it depends very much on my group members and especially their motivation" (4).
Work division *(Teams)*	How the work is divided. Is it a group effort, or do members work individually.	Working, together, individual, group effort.	Deductive (Rodríguez-Sánchez et al., 2017; Streicher et al., 2012).	This code is helpful to understand the group dynamic.	"One group member was the main poster designer, and the other group members made elements that had to be included in the poster" (9).
Hierarchy	How would the interviewees rank different platforms?	Gather-Town, physical Design Atelier, other/traditional online platforms.	Inductive	This code will help ranking the various platforms in terms of satisfaction/ user friendliness.	"In terms of hierarchy, GatherTown stands between physical education and other forms of online platforms" (14).

E. The most interesting quotes from the interviews

a. Sonia

1. “The visual aspect of GatherTown is nice as you can see other students and the lecturers, which gives you more independence”.
2. “The course is more what I expected… this course is more focussed on learning by doing. Also we were checked on how creative we are”.
3. “Before the course, I believed that someone who is creative is a writer or a musician. But after this course focussed on creativity, I saw that it can also be a spatial designer for example, an architect or even a doctor. I now see that one can be creative in their own sector.”

b. Bart

4. “I do in general like group projects, but it depends very much on my group members and especially their motivation”
5. “The contact with the supervisors was good, although it seems a bit childish walking around with an avatar, the software worked well in principle”
6. “The nice thing about GatherTown is that you can quickly have one-on-one conversations, the fact that there are avatars gives more clarity, since you can see if someone (a supervisor) is alone. So in that respect the visual aspect makes it much more natural to have conversations, it also makes it easier to walk into other groups. ”
7. “I didn't know most of my group members well… I did try to get to know each other, so I started introducing myself, but then it remained silent. It was very difficult, especially in the beginning because nobody wanted to get to know each other… Apart from one person I worked well with, I actually didn't get to know the rest of my group”.
8. "Creativity is a quality that ensures that you find a professional solution"
9. “One group member was the main poster designer, and the other group members made elements that had to be included in the poster”.
10. “I mainly consulted with the head of the poster design because there was not much feedback from the rest of the group. If others provided something, I and the head of the poster design would both give positive and negative feedback”
11. "I trusted one teammate very well, one half and one not at all"
12. "Sitting around the table, consulting and discussing was about 40% of our group effort, working individually was around 60%"
13. “Supposing I would have to work with this group again, I would make very clear agreements”
14. “In terms of hierarchy, GatherTown stands between physical education and other forms of online platforms”.
15. “I also think that the (COVID-19) pandemic is causing a greater craving for physical contact. Hybrid education would have already been a big improvement ”
16. “Working online means that you are much less concerned with developing ideas and much more with clarifying:" no, I mean it like this", and then you still do not understand each other. I takes much longer and it eliminates the joy out of designing together”.

17. Interviewer:

    “You just indicated that there are quite a few positive aspects to GatherTown, for example that you can see who is talking to whom, the supervisors are approachable, you can visit other groups and you can work individually but also quickly walk to group members when

you want to consult them, so that was quite positive. What's the most negative aspect of GatherTown in your view?”

18. Bart:
    - “I think GatherTown, like many other online platforms, has a problem with approachability. In the sense of, when you are actually sitting around the table and you throw something into the group, then everyone feels addressed and you can also look at them, then there is a certain pressure of "I have to answer something". I think in GatherTown, just like Blackboard Collaborate and Google Meet, if you're online and you suggest something, it'll be quite more easily, since it's less awkward. As a result, there is less of a need to respond.
19. Interviewer:
    - "Even if you were to address them personally?"
20. Bart:
    - "Then something comes out, but it feels forced"
21. Interviewer:
    - "Don't you think that's necessary sometimes?"
22. Bart:
    - “I think that in reality a faster response will come from people themselves. I think that in the digital world it is easier to hide, at least that's how it feels ”
23. Interviewer:
    - “And do you think that if you could have physically followed this course with the same group, that your group members would be more approachable, would have worked harder and that the group dynamic would have been better? Or do you think that because they were passive and did not show much effort, not much would have changed ”
24. Bart
    - “I think they would show more commitment, because I think designing is just a lot more fun in real life. Because the problem we haven't even addressed yet, is that pointing out things on a map takes ten times longer on a computer than in real life. Thinking and quickly sketching a few lines takes three minutes digitally, while with a marker it only costs five seconds. The whole design process would just have been a lot more fun in real life. That's why I think they would have more motivation in real life, not because they would put in much more effort but because they would have a lot more fun ”

c. Hanna

25. “Whether or not I enjoy group projects really depends on the group, it could honestly go both ways”
26. “The group dynamic was actually really bad. We did not have a lot of structure and also communicated quite poorly. It was probably my worst group dynamic I have experienced.”
27. “I expected that it would go pretty well since we were a well balanced group, therefore my expectations at first were quite high. Balanced in gender, nationality, a quite optimal structure. And I also felt that we had quite different roles”.
28. “I cannot imagine that working fully in GatherTown would benefit our group, we would probably get even less structured”.

29. “I knew all of my group members. I knew three of them well, one of whom I knew really well. He is like one of my best friends here. Only one group member I did not know that well, but he knew other people in our team”.
30. “Both in the physical class and GatherTown, the supervisors and student assistants were really accessible. In GatherTown you could see one supervisor walking around with his character which made it easy to walk to him. Although he also walked to all the rooms to check. I did not talk to the student assistants that often in GatherTown though. In the physical session the student assistants were always available. When I think about it for a second time, the student assistants were easier to contact in the physical sessions whilst the supervisors were easier to contact in the online GatherTown environment.”
31. “In the physical session, we had a table were we could discuss which was really nice. Although we sometimes also split up to another room so our team was divided in teams of two and three persons… In GatherTown it was very different. Since we could share each others screen, But it does get a bit too intense to have many screen sharing around. It was a bit difficult.”
32. “I definitely think that being in a physical environment stimulates creativity more than being in GatherTown. Also, it is difficult to say since our group felt unstructured in both GatherTown and the physical environment.”
33. “The thing with Google Meet for example is that most people would turn on their camera. In GatherTown we did not turn on our camera and also muted ourselves sometimes. In Google Meet it would be very boring if everyone would have their camera off. While in GatherTown you still have the avatar and the environment. Therefore we felt like we did not have to put our camera on.”
34. “I do think that it is nice to have a one-on-one chat. However, it happened more often that if two group members worked in close collaboration, they would call each other directly instead of using GatherTown. I personally did use it once.”
35. “In GatherTown I did not talk to other people. It actually felt kinda awkward to walk into someone else’s room, it felt like that was way more intrusive compared to real life. This is also due to the fact that you can’t see their facial expression, you can’t see what they are up to. So what if they are in the middle of a tense moment. Whilst in real life, you can sense how the moment is, ‘oh their laughing’ so I can go by and check what there are doing. So in GatherTown you just can’t see their whole body language.”
36. “In real life, on a six hour session I would only talk once to someone from another group.”
37. “Creativity is thinking of things that are not always obvious, thinking out side of the box, thinking about new perspectives, thinking for the future.”
38. “I can definitely say that I prefer the hybrid class over fully online. I did like having GatherTown as an environment to work online, but I also am not aware about the other options which are available in terms of software, so I can hardly say this is the best. The physical environment was nice and it was also nice to sneak peek on what other groups did. You could easily see what other people were up to. In GatherTown you cannot see other people drawing or researching. It is easier to be a bit lazy”.

39. Hanna:

    “It was very unstructured with the communication of when we should be finished with certain midway points, when we should have our meetings to catch-up. The communication of being flexible in some well, disrupted our structure. Two of our group members liked to sleep longer and work in the evening for example”.

40. Interviewer:

But there were specific days and times in which you could meet in GatherTown, when the supervisors and student assistants were available as well. So did this also not help in getting more structure and involving the people that liked to sleep longer?

41. Hanna:
    That is true, there were the Fridays, but I felt like we did not do enough work on the Wednesday or Thursday that it would be sufficient to work in GatherTown on Fridays. One group member preferred to work in the weekend…. The GahterTown session wasn't as productive we did not prepare well enough and we just tried to do our individual things, but you can't check what the other person is doing as you can't see them".

42. Interviewer:
    You are mentioning two very interesting things here. Firstly you say that you were more creative in the physical environment, can you explicitly point out what in the physical environment makes the group dynamic change so that you are more creativity. And secondly, you stated that GatherTown makes you more lazy. What about GahterTown makes you as a person within a group more lazy?
43. Hanna:
    I'll start with the first one. I think that in a way, why it is easier to share ideas and brainstorm, which is close to being creativity, in a physical session, we were like thinking that one idea was a pretty good idea, so we were working on it from home. And we had a little presentation to which the supervisor and other groups could comment and said: 'this might not optimal'. After this presentation we went home and felt very chaotic. The next session, when we were working together in the physical environment everything just became more clear. We had a see-through paper which we could use instead of basic sketches one could make at home. You know, working with layers and just seeing the perspectives on papers helped, in addition to a big whiteboard. This all helped in being more creative in the real life situation.
44. Regarding being lazy in GatherTown, it is just because you do not see what other people do. I feel like this is quite a psychological effect, when people do not see what you are doing you can basically do what you want. Whilst when we are in a physical session, people would go out for a little break, like for a cigarette or to get lunch, but we were still very focussed. In GahterTown you could go for lunch but it was quite since we muted ourselves and didn't have a background babble. You could even be gone, which also happened.

d. Valentijn

45. "If we were physically present, we would briefly present to each other in the morning. Then you also saw the intermediate results of other groups, and then we found that we were at a more creative level than the other groups. Then I am talking more about the design side."
46. "Creativity for me is making something, an idea, something on paper, something digital. What is new, what has been thought about. It should look nice. When people look at it, they have to understand what it means. That is quite specific because when you look at a painting it is already very different. We believed that when people look at our poster, they should think: "wow, this looks beautiful".
47. "In GatherTown as well as physically, the supervisors and the student assistants were approachable. This is easier within our faculty anyway. During the physical classes, we could talk about the smallest things, but we could always discuss that with the supervisor or student assistant. They certainly helped us in that respect, especially in the beginning. "
48. "I also have to say that we didn't spend a lot of time in GatherTown, although the possibility was there. But I think we've only been to GatherTown three or four times in total. But the contact was good. "

49. “I already knew half of my group members, and we left a few places free on purpose, because in the corona pandemic we hardly met any new people. So we left a few places to meet new people. But the others also felt very comfortable in our group. We even met outside of class, they basically entered our group of friends. So I think we had a very good group dynamic. ”
50. “We certainly took the time to get to know each other, we had a group member (an international), who found it quite difficult at the beginning to share her opinion. But me and someone else noticed this, when we got to know each other this changed. This was also very important for the design process. ”
51. “In the beginning, everyone still strictly adhered to the corona rules. But later me and my other group members also walked past other groups because our friends were in those groups. We sometimes also looked at the tables around us. During the presentations you could also see things from other groups ”.
52. “The presentations in particular ensured that we could compare ourselves with other groups, in the sense of how far in the process we were.”
53. “In GatherTown it has never happened that we walked into other groups to ask what they were doing… Even though it is easy on that platform to do this, we didn't really needed it. It is actually quite different, because you cannot really walk to someone but you see a webcam. It's much more impersonal. ”
54. “Physically you feel the pressure a bit more, that the result must be good. What you also have is that when you physically meet, then it really has to be finished on that day. While if you have an online meeting you say we meet on Tuesday evening, but then it is almost Tuesday evening and then people say let's do it on Wednesday evening because I am not ready yet. So it is always getting postponed.”
55. “Compared to a Google Meet or a Microsoft Teams it is certainly much better. But for these kinds of projects it is just always a hundred times better to get together physically. So that you can really discuss those things with each other. What I wanted to add is that if you have a one-on-one conversation online, it is much more difficult to gauge how that person reacts to something you say. While when you are physically together, this is much easier. Gauge someone's feelings is just much more difficult online ”.

56. Valentijn:
    - “We made a lot of our posters in Adobe software. That makes it very difficult to work together. Only one person can work in it… That is why we made a better division of tasks at the end, so that the people who could not work in Adobe got to work with the text and the underlying theory. The things we made in Adobe were certainly based on sketches we made with the whole group during the physical class. So it was certainly a group project and effort. ”
57. Interviewer:
    - "You just mentioned that you were making sketches, were they mainly made physical?"
58. Valentijn:
    - “Yes, we never actually made sketches online, when we met online it was only to discuss texts, discuss what had to be done individually for a deadline or to show any intermediate results and ask for feedback.”
59. Interviewer:
    - “Do you have any idea why you barely met up in GatherTown, because there was definitely a possibility. There were even supervisors available one day a week.
60. Valentijn:

- “Why we chose this, I think, is mainly because it is not mandatory, and then you plan your day differently. Then you work faster individually or do other things. It also just took a lot of time to create things in Adobe, so it was not convenient to meet every hour. ”

61. Valentijn:
    - “The biggest advantage of GatherTown is coming together, for example even if you don't live in Groningen yet or because of corona. The biggest disadvantage is that it may be less easy for you to share your opinion online. And that after a long time shouting from behind your computer screen you are also done with it. I also think that you have a lot less face-to-face conversations online. You also miss things, such as getting food together around noon, which is of course not possible online. ”
62. Interviewer:
    - “So you are actually saying that online contact is more formal and that physical contact is more informal, since because you can take a break together for a while? So even though you can see each other online and have one-on-one conversations in GatherTown, it is still more formal? ”
63. Valentijn:
    - “Yes, it is very strange, but you think very quickly about: what if someone listens in, or someone records this. You are more likely to pay attention to what you say. People quickly turn off their camera and microphone when they walk away. So you get distracted much more quickly. Personally, I was just really happy that I could do it physically ”.
64. Interviewer:
    - "So physical is just a lot more fun than online?"
65. Valentijn:
    - "Hell yes. You just get to know people much better. If you want to show something quickly, it is also much easier to sketch. You can do things together. The vibe just gets a lot better because the informal conversations take place much more often. ”
66. Interviewer:
    - “…. But why is it that you have easier such informal conversations? ”
67. Valentijn:
    - “Purely because you can look at each other, you know who you are talking to, you see the people around you. You could touch each other, so to speak. You do that much less online. You start listening to music faster, because you don't see each other, you also start a conversation less quickly. You are also more often distracted, which means that you are no longer really involved with the project but are more likely to have informal conversations. ”
68. Interviewer:
    - “Can I conclude from this that even though you are in a group and you are working on a group project, plus the fact that you can see and hear each other in GatherTown, you still work individually? That people withdraw more quickly? ”
69. Valentijn:

- “Yes, because the step is very small, because with one click your camera and microphone are switched off ... If we worked alone at the computer, we often worked at home. Only when decisions had to be made, we did so physically. ”

e. Harmen

70. “I thought it was a fun course, also because we could physically see other students again. Besides, I made friends at the beginning of the academic year, two in total. And this was an assignment in groups of five, so there were two more contacts. So that was new and nice. That makes it very cosy. In addition, the course was very creative, and that also makes it dynamic. ”
71. “We actually started the project right away… All in all, we got to know each other along the way”.
72. “At one point we came up with the brilliant idea, credits to Jelle, to do a start-up for each Atelier session. To see where we were and what we wanted to achieve that day. And that made it a lot clearer and more streamlined. That also meant that we easily finished the assignments within the deadline, and that there was no stress. ”
73. “In the physical Atelier we had a whiteboard. Every time a professor came along, we could write down our ideas and that professor could also comment on / contribute ideas. And with the GatherTown session it was actually more checking whether you are busy, occasionally bringing in a new idea but less interaction. ”
74. “We used the whiteboard quite a lot, drew up a lot of plans and hung them up, and discussing them just doesn't go online. Then everyone has to share their screens and that gets complicated. A professor cannot really influence that either. "
75. “At some point, work has to be done, and the GatherTown sessions are just suitable for that. It is also possible in your own time, which is great. And that we could always access it, that when the five or even four of us had time, we could get in quickly. Then you can just write stuff. ”
76. “We had a product that the professor was very pleased with, that applied to all parts… Only in one part we had made the mistake not to look into the rubric. As a result, we had just passed, even though we had a very good plan. We just hadn't looked at what was absolutely necessary. ”
77. “Creativity is a very broad concept, the standard meaning one gives to it is, for example, to be able to draw beautifully, to be artistic. But being creative also means looking for solutions where they are not immediately obvious. It can also be creative, being able to use words well, think in a different way, philosophise. It is very wide. It is difficult to give a clear definition ”.
78. “If you take the aspect of thinking ‘out of the box’, then we have certainly delivered a creative product. We applied different things in our poster layout, interpreted making maps differently… We had ambitious plans… It was not a standard plan… ”
79. “At one point there were two girls who asked if anyone wanted to go to the Noorderplatsoen to relax. So they were actively engaged in making contacts. There were no regular breaks either, so that helped too. There was also a group of smokers outside, so they were chatting with each other. So it happened quite a lot, that people chatted and watched between groups. ”
80. “In any case, I think that breaks and interruptions can be extremely valuable to get out of a thought loop. To break a stigma. To look with a fresh look, just a little different. Moreover, you also learn to communicate with people as efficiently as possible to a certain extent. Whilst working we learn what someone means, but during a break you get to know someone else in a completely different way. You understand each other better, the language, the opinions, you talk about things at a different level. Even when it comes to the project, you communicate differently. So in that sense, it does stimulate the creative process. "

81. “I think that people are much easier to address physically. A working attitude is also very difficult to check online. At some point, the work has to be finished, and even if someone does not deliver the work online, it is quite clear that they have not done it. But that is always afterwards. During a physical lecture you can see very clearly whether someone is busy or not. Just walk around, easy to discuss too. Instead of asking online whether someone will come apart for a while, you can physically just ask: "are you doing fine?". Moreover, it is always easier to defend yourself online… I do notice that it is a bit safer, it feels much less responsible during an online session. ”
82. “Online you can easily say, it didn't work out, I don't get it or I can't find anything online, that was it. Then you have justified the situation. While physically, you can't get away with that. Like asking for help, that is a lot easier physically. Plus the fact that you just have a physical product, which makes it much clearer too. So holding someone accountable was much more difficult online because you can't be sure if they did their best. Doing your best is much more important than delivering a perfect product, but that cannot be checked. ”
83. "Perhaps it is useful to know that we have not guaranteed the 1.5 meters within our group."

84. Harmen
    - “The start-up helped us enormously, and with that we as a group always divided the tasks. Those were just practical tasks, parts of the project. And so there were no very clear roles within our group. Everyone worked at the same level with the same goal. In the end, one generally took a little more initiative, one wrote a little more on the whiteboard, one was leading the meetings. Some have also spoken to the professor more often than others. In principle, there was no clear division of roles. ”
85. Interviewer:
    - “And if we then continue on those tasks, you started every day with that start-up and then you are all around the table. That is a moment where you are discussing and making a plan. How often did that occur during that day? How often did you sit around the table together and how often did you work out something on your own? ”
86. Harmen
    - “All in all, we quite often opted for a working method in which we did not work individually but in pairs. Because we noticed that we could clearly strengthen each other and therefore deliver better work than if everyone went to work for themselves. The problem was that this was physically easier than in GatherTown. In GatherTown we came online every hour to share what we had made on our screen. That was really individual, in GatherTown. While during the physical session we were actually constantly coming together to help each other, to look, to check, to consult each other. Then we really had a number of times when we consulted together. ”
87. Interviewer:
    - “But it should be possible right? In GahterTown? Because the software makes it possible that you can also briefly talk together. Then you can have a one-on-one conversation. You have not made use of that? ”
88. Harmen
    - “No, we had a task and we divided it into five smaller tasks, and saw each other again in an hour. This is how we worked in GatherTown “

89. Interviewer:
    - "Why did you have two different working methods?"
90. Harmen:
    - “I think mainly because of the fact that screen sharing didn't always work well. Then the connection was not good, or you could not read something properly. Moreover, you can't draw on a board with just the two of you ... It's just much more time-consuming. ”
91. Interviewer:
    - “And suppose this were to be optimized, that sharing your screen becomes easier and you can also draw something together, would that have actually changed your working method? Or would you still work more individually due to the fact that it is online? ”
92. Harmen:
    - “I think it would still be a bit more individualistic, also because we had hybrid classes, instead of working completely online. That way we had the opportunity to do the big creative tasks in the class and during the GatherTown session, for example, write texts. We also worked together in google docs… It was a lot more streamlined in the physical session. ”
93. Interviewer:
    - "So in other words, because you had hybrid lessons, did you use GatherTown differently than if you had been completely in GatherTown?"
94. Harmen:
    - “I think if we had been completely in GatherTown, we would have looked for other solutions, drawing maps and discussing. Perhaps we would have employed other platforms as well. ”
95. Interviewer:
    - "I hear you say that you really liked the physical situation more than online, is that correct?"
96. Harmen:
    - "Yes that's right."
97. Interviewer:
    - "Can you explicitly indicate why physical class is so much fun?"
98. Harmen:
    - “An important thing is anything but work. You can take a physical break together. Talk about the biggest nonsense, elections at the time ... That is not possible online, it is possible in theory, but it just doesn't work. It does not give the same fun. It's more alive physically instead of online. Online there is the GatherTown environment, and it looks pretty fun, but interacting with people is much more complicated than such a screen. I also noticed that there is a lot more energy in a physical room. Everyone hangs around their computer online. Physically you can really greet each other. Just wave, laugh… Human interactions everything around it ”.
99. Interviewer:
    - "You also said it's a lot more fun and casual, so even though you can have one-on-one chats in GatherTown, it's more formal, despite knowing the people, is that right?"

100. Harmen:
- "That's right."

101. Interviewer:
- "Very interesting, that you know someone and it still becomes more formal."

102. Harmen:
- “I don't know why that is. Online I can sit behind the computer in my bathrobe. And physically I do put on decent pants, a shirt. That's more formal in that sense, you have to pay more attention to your manners. But still, it feels more informal. ”

f. Luuk

103. “We brainstormed a lot together physically, as well as using Whatsapp and Collaborate. We only used GatherTown for the first time after four or five weeks, partly because we also wanted to consult the teachers. But otherwise we have not actually used GatherTown. ”
104. “I knew one group member, since I had worked with him before. The other group members I knew partly. ”
105. “We took our time to get to know each other. Normally for assignments you read the assignment carefully and then you get to work. We have now tried to do it differently. Also because we were on campus all day, so we had enough time. So we first talked for an hour about who we are and what we do. Later we got to know each other really well, and even met each other outside of school assignments, outside the campus. We even went cycling once more. ”
106. “I am quite satisfied with our product. But we had a group where everyone had quite a lot of ideas. So actually we had too many ideas. So we were constantly talking, arguing, because we also had people in the group who were quite perfectionist. So it took a while before we had the same picture. I am quite satisfied with the end product. ”
107. “Our product had a very clear story. It fits togehter. That was very strong. I also noticed this in the presentations. Our story was very clear to follow. ”
108. “In creativity it is important to be open minded. If you look at creativity outside of our assignment, it is mainly that you have solutions for various problems. Different ideas to make new things. It has to be new, open minded, ideas, and you have to be able to present it. ”
109. “Is our product creative? At first I would say yes as it is definitely new. But all the ideas we had, come from existing ideas. So we looked in the world at what is there, and what examples are out there, because you also use pictures and pictures for the poster, so it is not creative in that respect. But the cohesion of the different things together makes it more creative. That you still bring different things from different places together. ”
110. “In the beginning we were mainly discussing what everyone thought, but then we found out that it was also important to read the assignment together, interpret the assignment. That everyone looks from the same direction.. Because we had not done that during the first assignment and everyone had interpreted the assignment differently. The second and third assignment we did better "
111. “We also made a lot of things and sent them to each other to ask if everyone agreed. So there was a lot of discussion but we also checked each other’s input. ”
112. "Sketching and designing a poster (online), we worked a bit more alone there, because everyone does one specific part anyway."

113. “The fact that we work more on campus instead of online is mainly because everyone sees the same object, laying in front of your physically and everyone has the same attention. You can also talk through each other, which is also important during a discussion. Also, everyone dares to express themselves a little more. You often think during an online conversation like: ‘something similar has probably already been said’.”
114. “We used Google Meet and Collaborate because we were already familiar with it, it is just easier. GatherTown is new after all, so I didn’t really know how it works. But if I were to call someone I would say don't do it in GatherTown, rather call in Google Meet. ”
115. “We didn't walk around much in the beginning and also didn’t looked at other groups. Only during the presentations and at the end we did, but then everyone had already developed their own plan anyway. I don't know if we copied a lot of things from other groups, but it sure gave us some inspiration”.
116. “It also has to do with concentration, that you can move away from your group for a while. I really love to walk around and talk to everyone. So I also ask: "how are you, what is your plan". Not only to hear new things, but also to let go of your group for a while, and then have the concentration to continue. Because if you are in your group for 6 or 7 hours, you also want to talk to someone else. ” - “We didn't do that online”.
117. “The good thing about GahterTown is that you can always go online, you can always go in. Seeing and speaking to each other, it just all works. Screen sharing also works fine. So I think it is a useful program, but it is yet another program next to all the other platforms. ” - “It also looked a bit more like a game to me when I got in there. I don't really know how positive I am about that. Of course it is always better to be on location with people. ”
118. “I also think it's because of corona. You have fewer contact and you are drawn more quickly to the people you already know. Maybe it will be different if we have had classes on campus all year long, since you got to know more people. You then might faster talk to other people. People you have already seen or who you already know. ”
119. “If you spend a whole day on campus together, you create something that you all put a lot of energy into and which you will also be proud of. While in GatherTown you come online for an hour, because someone in your group said: "come online because we have do something". If you are not completely there, you will become less proud of it and your end result will also be less great. "
120. “I like the mix of working on campus and doing things individually at home. Because some things, putting together a poster is not possible with the five of you. ”

g. Lilia

121. “… It was actually nice for me to follow the course online, Because I am not in the Netherlands and I was not planning on going back… I enjoyed the lectures, although I thought that they were a bit basic. They weren’t really revolutionary but I guess that was the point. Also the GatherTown sessions were really nice, a bit awkward, because of the fact that they were online. In person you can be a lot more comfortable to talk to, get to know your peers, online it was a bit like: ‘hi, do we really have to turn on our camera’s, okay let’s start with the project’. Everyone in my group was new to me, I haven’t met them before. A bit further down the course I got to know a bit better my group. But still I have no idea were two of them live. NO clue, and it was rude to ask to after two months of working together. So that was a bit weird. Whereas on campus I would imagine that you would talk a bit more about yourself, getting to know each other. Which I really feel like helps for the project.”

122. “Yes we had a plan already, and everybody was just working on their own part, and when someone had a question of anything we just turned our microphones on to ask for help. Everybody felt more comfortable working on their selves and having their camera off. Even in the first sessions we didn’t really communicate, I felt like I didn’t know what to do and in the end I was just pretending to be researching so that was not productive at all. And alter when I had the chance to talk to one of my team mates she told me that she was doing exactly the same. Because the plan wasn’t really clear to her. So later we had more planning and a more structured approach.”
123. “… It was a lot nicer when we finally got to know each other”.
124. “… Everybody contributed to the look of the poster, even though I made it. During the whole thing some people were more active during the discussions. But we had all equal amount of the final product…”
125. “I do think that our idea was creative, really a nice concept. But later we found out that we didn’t develop it that well. So we could have incorporated more creative thing, also the look of the poster was a bit standard. We could have used more graphics. But I still feel like we managed to be creative”
126. “Maybe thinking out of the box. Not sticking to the most logical approach. For example, for some posters you can have just texts and a map but I saw that some posters were really complex and had a lot of graphics, had hidden texts all over it but it was still really clear what they were doing. So I guess just not sticking to the obvious.”
127. “The experience would have been a lot more different and a lot better, not that it was bad but I think that it would have been a lot better physically.”
128. “The social aspect, communicating and sharing ideas, being closer to each other. Also I think that the creative process would have been smoother and more productive if I were on campus because when you’re working together you’re constantly sharing stuff and it is not possible to pretend to be researching when you are in a group with people in a room. Everything would have been, not easier because I can’t say if it was easier, but a lot nicer.”
129. “Sometimes we needed to wait a long time before a supervisor came to our room, because they were working with other students. But it was quite possible to approach the supervisors, although it sometimes took a lot of time.”
130. “I think I only talked twice to other groups. Our supervisors were always like: ‘you can always go to other rooms, see what they are working on’. But we didn’t really take advantage of that because we were more trying to, we weren’t that curious to see other peoples projects. We could see them during the presentations, but a couple of times we had some questions about the assignments, so we had to ask them”.
131. “Probably yes, because some student came to our rooms and were asking us questions. We were quite helpful and helped them with their problems. We didn’t really have clear questions and clear problems to ask.”
132. “I just turned of my mic and camera and just left. Got coffee, got food. We didn’t really communicate during those times. When we were chatting just talking more informally, was either at the beginning of the session or in the end before we left. Because we took breaks because our eyes got tired looking at the computer all day, so we didn’t really want to look at the computer anymore.”
133. “Definitely, I think that those were not really the best moments, but they really helped with our dynamic and were just talking about other courses or complaining about something. One of the guys had a really bad hangover one of the days. So we were a little bit more careful with him. So that really helped with our group dynamic. I really enjoyed those”.
134. “I would have enjoyed a space like this were I can met other themes and other people, other then those four members in my group. Though I am not sure how that could be incorporated. Because if it is in the beginning of the sessions it would take half of the session, when we would just talk and never go to work.”

135. “I guess yes, because the wall isn’t really a barrier but it is a mental barrier, they are in a separate space and you don’t really want to bother them. They might be discussing something very important, if it is just open you feel like you’re in the real studio and peak in their project, peak on their table and listen to what they are talking about. Maybe if it was like this I would be more inclined to talk.”

136. “I actually really enjoyed the platform, I thought that it was really clever and I had no idea that it existed before.”

137. “I didn’t enjoy the fact that during our sessions, at the same time their were those workshops, I did enjoy the workshop but they took awauy time from our sessions. And I did not understand because they were recorded and we could watch them back whenever we wanted to. But they were still taking away our studio time. And those three days were basically lost. The more time we spend on GatherTown the better our group dynamic turned out. SO I think that the workshops should have been scheduled in some other point.”

138. Lilia:

“… It was actually nice for me to follow the course online, Because I am not in the Netherlands and I was not planning on going back… I enjoyed the lectures, although I thought that they were a bit basic. They weren’t really revolutionary but I guess that was the point. Also the GatherTown sessions were really nice, a bit awkward, because of the fact that they were online. In person you can be a lot more comfortable to talk to, get to know your peers, online it was a bit like: ‘hi, do we really have to turn on our camera’s, okay let’s start with the project’. Everyone in my group was new to me, I haven’t met them before. A bit further down the course I got to know a bit better my group. But still I have no idea were two of them live. NO clue, and it was rude to ask to after two months of working together. So that was a bit weird. Whereas on campus I would imagine that you would talk a bit more about yourself, getting to know each other. Which I really feel like helps for the project.”

139. Interviewer:

“You’re mentioning a lot of interesting things… You nicely explained that it is more difficult to get know your group whom you didn’t know beforehand. But why was it so difficult to got to know them? Why didn’t you at the beginning started to get to know each other?”

140. Lilia:

“I feel like even from the beginning of the entire program, people were a little bit shy, even in person. For me it is easier to get comfortable with people when I see them in person. And overall people were a bit more shy because they are first years and a bit younger. But I guess, online since we were left alone and everybody was kind off: ‘what do I say, how do we start’? So we were talking about the project itself, how we should start. And later one of the guys from my group had a lot of internet problems, but when he came he said: ‘tell me about yourself, I need to know more about you’. And then we managed to share a bit more, so I was not really sure if it was because of the shyness of the people, or it’s just even more difficult online because you are together, but not really. You can always turn off your camera, turn off your microphone and pretend you’re not there.”

141. Interviewer:

“You just said that you asked questions in the group whether or not you need to turn on the camera for example, did you?”

142. Lilia:

“Yes I did. Especially at the beginning I felt like it is really nice to see the reaction of the person. It is really when you’re constantly interrupting people because you can’t see if they are about to say anything. And also when someone looks a bit confused you can ask: ‘is

everything going well, do you need any assistance or anything?' I think that is really important so I turned on my camera and the rest as well. Later, we got a bit more comfortable and we had a lot of sessions where we were just working so we didn't have the camera on, it was just not necessary at that point."

h. Victor

143. "So basically, your understanding of infrastructure is then the way we collaborate? In the sense that with online technology this shifts."
144. "I can definitely see that GatherTown was a little bit more playful than anything else. I was for first year students maybe quite an advantage. Since people joined online, sometimes they were in different countries… Everyone was just laughing that you impersonate your own self, like a game, but it also is realistic, so a very interesting room to experience, and talk to people, have more similar conversations that you would have in a normal Google Meet."
145. "I think that it might look a bit strange when you eat and drink and sit in front of your computer. So people have to get used to that. But in a designated room, to have a break room would definitely help. Not make it compulsory but available… It also helps if the lecturers introduce the room, so they can say: 'we set up a break room for you, since you guys are first year students and you do not have the possibility to interact with each other, you can go there. Nobody is forced to do so, nobody does not have to have their camera on, but just make it available."
146. "Most of the people didn't even have their camera on when they presented, you should at least turn on your camera. Some people had these excuses of: 'I don't have a webcam', so in that case it cannot be solved. You can not force somebody to purchase a webcam for that… I think that there is no real way to solve that problem other than saying that it makes it a more real life situation. But of course people are free to choose… I guess it is just the comfort, maybe people also don't see the value of it. It makes it more personal but maybe people don't want to make it that personal. I don't think that there should be much of an intervention."
147. "Illustrator was not available for the students…"
148. "Technically online you can still talk to each other… So it is also up to you, whether you open a new tab and mute your mic or whether you stay in collaboration and has a chat."
149. "Online always has a disadvantage, because you cannot share your thought as quickly and as presently, as physically as possible. So you're there and you can talk but you cannot really express yourself that well. Also when you miss a drawing table, sketching paper and so on. So how do you share your design and your thoughts, through some form of communication."
150. "In the GahterTown sessions I felt detached. They did not have many questions, even though we walked around. You really have to push people to doubt their designs. To have a conversation about it. Whilst in the physical session, they always asked me in the last half hour, what do you think about it?"
151. "I have seen all end-products. We might a final PDF of all works, so everyone can click on it see it. I must say that I did not see that much of a difference, in the way that the posters looked like. But in a content way I believe I have seen better designs, the designs were more reasonable. They developed their thoughts and were always doubting what they did in the real session. So they were always questioning why doing this, why doing that. So that woken them up to have reasonable approaches that are feasible and realistic. Everything just works out. Whilst in the online session I felt like: 'why did you do that'?... I also heard from the other lecturers, they always mentioned that online the presentations were also disappointing. Online they were quite stuck in their train of thought and could not really

develop further. It was quit noticeable that in a content way they were lacking behind. For the reason of not being able to collaborate as nicely. Also because they did not ask that many questions."

152. "In GatherTown you can see when people talk. Then a speech bubble will pop-up. Sometimes we see that of course, people have to talk. But it was way less compared to a physical setting, you can really sense the atmosphere of the room. When physically start talking, everybody in the room does that as well, then the voices raise after a while. You really saw that in the physical session, especially at the end of the day people get headed up. But online people were quite tired as I said. They had their task, knew what to do… Everybody is just in their phase of research and the collaboration might not be productive, because they did not have the right environment for that, or resources. So I feel like a lot of groups I have seen did not talk as much as they could have."

153. Victor:

"Because you have these rooms setup for each group, also with border in a way, that there were not really groups mixing. One's a group has their group members than they stay in that room and they don't walk around really, they would just stay there the whole day… You see people talking in a sense, not to the extent of a normal session. In GatherTown people rather quickly disabled their camera and audio. Often times when I was walking into the rooms they still had either their camera switched off and sometimes even their microphones, so they would really work on something else. So they really had their task, so they collaborate afterwards. So I feel like there were fewer informal conversation. I heard from another supervisor that some students were still playful… but it felt like there was definitely less communication. In the physical session, people where just sitting and talking to each other and especially between the different groups, walking around."

154. Interviewer:

"… Do you have any idea why people do not walk around in GatherTown, because it is possible?"

155. Victor:

"Probably because they did not see any value in that… Also of some people would do it, other people would join, but probably everybody thought that it was just more efficient to work with your group. They wanted to push forward their own ideas, and not necessarily open up to other ideas, because they simply worked on different concept and spatial designs. It was mostly, not seeing too much efficiency."

156. Interviewer:

"How then come that in the physical environment students did see the advantages of it?"

157. Victor:

"I think one factor was particularly the posters they had from the first week. The first week everyone was still in their own group, but after they had the analyses done they knew they could benefit from walking around and so every group had their poster next to them basically, and so people started to walkaround and then interaction happened. Also in breaks, every break people would be chilling out in the main room, where you can talk to everybody else, so I mostly so the interaction through these two things. I guess in the online environment we had the digital atelier presentation sessions, a PowerPoint basically, where you could see everybody's work. So probably they didn't see the need to walk around because we had this file for them, and so there was no interaction happening."

158. Interviewer:

"So to summarise, in the physical sessions there is a physical visual attribute, so you see each other's poster and you see what people are making, which is lacking on GatherTown?"

159. Victor:

"Yes exactly… In theory you could see what they share on their screen, but the rooms where way more private. The rooms were designed with, they had a sort of open door but around there were strict borders, whilst in the real life sessions there were no borders. There was nothing holding them back to walking up to each other."

160. Interviewer:
"I think that indeed that it is a very important spatial feature. Perhaps unconsciously the borders block people from walking in to each other…"

161. Victor:
"On top of that, if the micro[phone or video is disabled, they have no incentive why you would walk up to that person…"

162. Interviewer:
"… Do you think that it would be beneficial to create a room like the physical design atelier? Just a few tables with no borders?"

163. Victor:
"Yes, and perhaps also some space which is designated for a break. From there you can have a border, so you have one place to work and one room where you have breaks. I think that it would definitely contribute to more interaction with each other. Because you are in the same room, although on a different table, you're not directly connected but asking or chatting would be more easy."

164. Interviewer:
"You mentioned a very interesting factor, the breaks. So I have two questions, but let's first start with, why do you believe that the breaks and especially like you've seen them physically are so important?"

165. Victor:
"This comes down to this informal conversation thing, that people also need to connect on a social way with each other in order to be comfortable to share their ideas. They also want to be comfortable with their social expressions. SO in a break it is quite an informal session in which all of that progress is not so important anymore and you can just talk about whatever you want. It can really contribute to opening up to each other… When groups online had a break they would just disable their camera or left the GatherTown session… So it is a totally different experience they have, a break online. I think that if you have a coffee or a small snack with each other that is a lot nicer."

166. Interviewer:
"You had the same course last year fully online, and so did your fellow students. There were no students who had physical class. Do you think that because you could not compare, do to the fact that there were equal opportunities, you felt more at ease with the situation?"

167. Victor:
" Yes I totally think so. It is always up to a personal perception of these things, I saw it as an opportunity. I like remote work, freelancing, as long as it is efficient and effective. This is also what my group contributed to. In that sense we were really positive about the course, despite the pandemic, because we did not have to postpone our studies. The rooms were also filled up pretty soon. I think that the people who only had the chance to meet online really felt like they were missing out on something, some opportunities. So I definitely think that people compare themselves to others with better opportunities. If everyone was online we were jst happy for the course continuing. There is always some comparison always involved. Either consciously or subconsciously."

168. Interviewer:
"Perhaps it is also because of the COVID-19 situation that people are being at home a lot and you do not go to college at all, people just longed to be with other people, to see other people.

So do you think that the people who did have physical class are maybe even more positive, because they could finally see other people?"

169. Victor:
"Yes definitely. That is also related to human-wellbeing…

170. Interviewer:
"Do you think that in the end the grades of the online and hybrid class are quite the same? Or was there a ½ point difference, mean wise?"

171. Victor:
"There would probably be a difference. It confirms what I said earlier about the content, being more advanced in the physical setting… If you have some sort of vision and you start to develop it over and over again, you develop it into the right direction that is the most productive way you can think of a solution really. Of that is not necessarily happening in the online environment there is a high chance that these grades are lower because their design was just not as suitable for the problem."

172. Interviewer:
"So does this then link back to when you said that they ask less questions to you when you were online? So you had less opportunities to be critical?"

173. Victor:
Yes I think it was the reason why they, well it is a combination of all these factors, of not necessarily talking as much to your own group, not talking to other groups, not talking to the lectures, missing out on opportunities. You're up to your own luck. Sometimes you don't even think that you have a question, because you didn't think of certain aspects yet. So when you walk around in the online setting, you go to each group and you push them with why do you do this? So the lack of interaction in the online session is definitely a contributor to essentially also lower grades."

F. Cronbach's alpha, checking internal correlation between the questions 3-16.

a. Reliability statistics for the cronbach's alpha.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,829	,837	14

b. Item-Total statistics cronbach's alpha.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
I enjoy group projects.	49,31	43,835	,593	,671	,807
I felt comfortable with my team.	48,91	43,572	,669	,850	,802
My group is supportive of thinking out of the box.	49,31	47,190	,410	,641	,821
Even though I made mistakes during the creation of our product, I used those mistakes as an opportunity to grow and improve the project.	49,16	48,072	,483	,558	,818
The supervisor was accessible and comfortable to contact.	48,59	48,249	,549	,608	,816
The supervisors created a professional working environment.	49,03	43,967	,649	,802	,804
Most of my team members and I were even before the project started good friends/ acquaintances	50,88	47,790	,220	,492	,842

When creating our product (the posters) our group has used a wide variety of sources.	49,16	49,297	,269	,619	,830
Our group has experienced an aha-erlebnis (a sudden insight/eye-opener/Eureka moment)	49,50	46,710	,494	,610	,816
It was clear who was responsible for which part of the assignment	49,66	52,039	,045	,407	,843
We spend more time around the table discussing and communicating together than working individually	49,31	47,577	,379	,667	,823
I believe that our group delivered an innovative valuable product	49,22	43,402	,732	,881	,798
I believe that our group delivered an original/surprising product.	49,09	46,991	,556	,661	,813
The product is a collective group effort instead of individual parts tied together	49,09	44,152	,584	,734	,808

c. Reliability statistics recalculation without question 12.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,843	,853	13

d. Item-Total Statistics recalculation without question 12.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
I enjoy group projects.	45,88	42,823	,577	,668	,826
I felt comfortable with my team.	45,47	42,773	,634	,825	,822

My group is supportive of thinking out of the box.	45,88	45,532	,442	,639	,836
Even though I made mistakes during the creation of our product, I used those mistakes as an opportunity to grow and improve the project.	45,72	47,047	,456	,557	,835
The supervisor was accessible and comfortable to contact.	45,16	46,910	,556	,604	,832
The supervisors created a professional working environment.	45,59	42,636	,658	,801	,820
Most of my team members and I were even before the project started good friends/ acquaintances	47,44	46,125	,243	,465	,857
When creating our product (the posters) our group has used a wide variety of sources.	45,72	47,757	,290	,616	,845
Our group has experienced an aha-erlebnis (a sudden insight/eye-opener/Eureka moment)	46,06	45,673	,474	,586	,834
We spend more time around the table discussing and communicating together than working individually	45,88	46,306	,378	,657	,840
I believe that our group delivered an innovative valuable product	45,78	42,176	,734	,880	,815
I believe that our group delivered an original/surprising product.	45,66	45,459	,584	,647	,828
The product is a collective group effort instead of individual parts tied together	45,66	42,749	,598	,721	,825

G. Checking normality for the average creativity scores of students.

*group 12 hours per week in GatherTown equals group 1.
** 3 = group 4 hours per week in GatherTown and 8 on Campus and equals group 2.

a. Case processing Summary of the Normality test for the average creativity scores of students.

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	In which group are you enrolled?	N	Percent	N	Percent	N	Percent
avr_pstudent	12 hours per week in GatherTown	15	100,0%	0	0,0%	15	100,0%
	3	17	100,0%	0	0,0%	17	100,0%

b. Descriptives of the normality test for the average creativity scores of students.

Descriptives

	In which group are you enrolled?			Statistic	Std. Error
avr_pstudent	12 hours per week in GatherTown	Mean		3,4718	,11106
		95% Confidence Interval for Mean	Lower Bound	3,2336	
			Upper Bound	3,7100	
		5% Trimmed Mean		3,4729	
		Median		3,4615	
		Variance		,185	
		Std. Deviation		,43013	
		Minimum		2,69	
		Maximum		4,23	
		Range		1,54	
		Interquartile Range		,62	
		Skewness		-,257	,580
		Kurtosis		-,266	1,121
	3	Mean		4,1267	,11405
		95% Confidence Interval for Mean	Lower Bound	3,8849	
			Upper Bound	4,3685	
		5% Trimmed Mean		4,1408	
		Median		4,2308	
		Variance		,221	
		Std. Deviation		,47022	
		Minimum		3,08	
		Maximum		4,92	
		Range		1,85	
		Interquartile Range		,62	
		Skewness		-,639	,550

	Kurtosis	,371	1,063

c. The tests of normality for the average creativity scores of students.

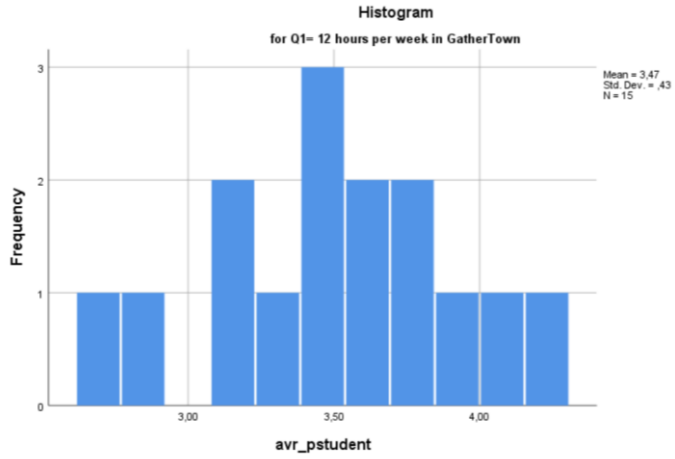
Tests of Normality

	In which group are you enrolled?	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
avr_pstudent	12 hours per week in GatherTown	,157	15	,200*	,975	15	,928
	3	,164	17	,200*	,964	17	,715

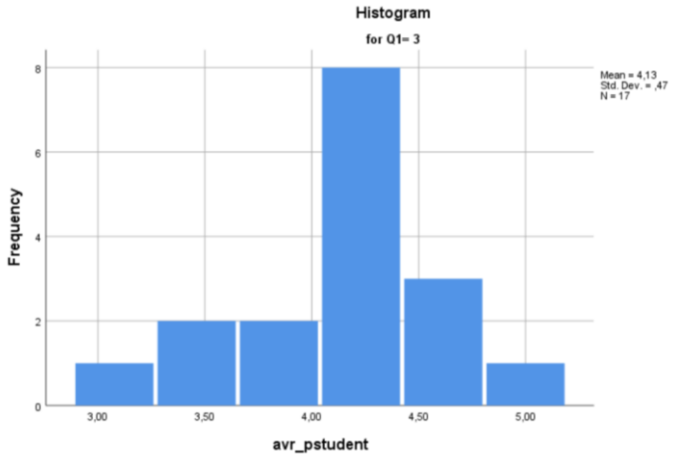
*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

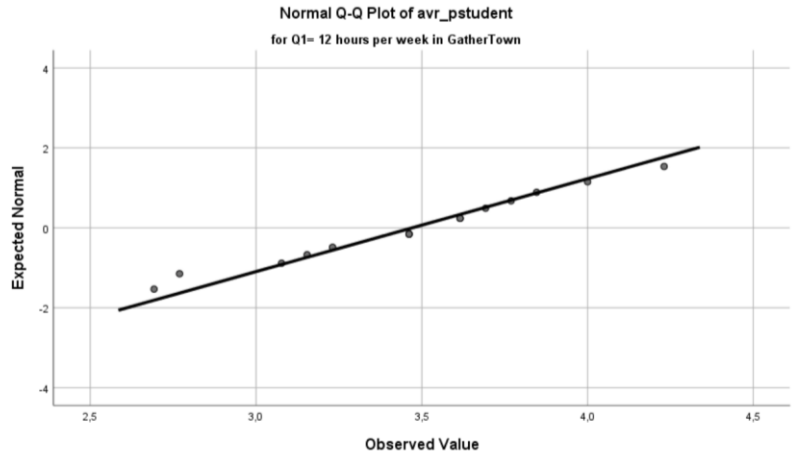
d. A histogram of normality for group 1 regarding the average creativity score.



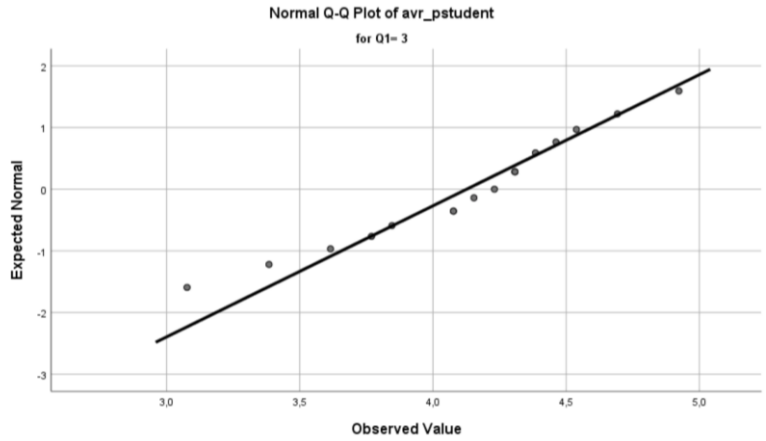
e. A histogram of normality for group 2 regarding the average creativity score.



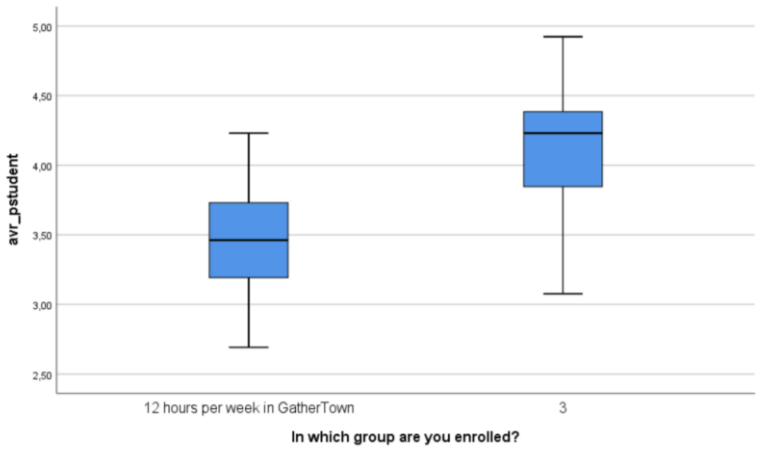
f. A normal Q-Q Plot of normality for group 1 regarding the average creativity score.



g. A normal Q-Q Plot of normality for group 2 regarding the average creativity sco



h. A Boxplot of normality for both group 1 and group 2 regarding the average creativity score.



i. Welch Two Samples T-test regarding the average creativity score of students.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
avr_pstudent	Equal variances assumed	,085	,772	-4,090	30	,000	-,65490	,16010	-,98188	-,32793
	Equal variances not assumed			-4,114	29,952	,000	-,65490	,15919	-,98003	-,32978

H. Checking normality for both group 1 and 2 for question 17.

Tests of Normality

	In which group are you enrolled?	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
What grade would you give working in the GatherTown environment	12 hours per week in GatherTown	,231	15	,031	,914	15	,157
	3	,235	17	,013	,888	17	,042

a. Lilliefors Significance Correction

a. Mann-Whitney U test for question 17, both group 1 & 2.

Test Statistics[a]

	What grade would you give working in the GatherTown environment
Mann-Whitney U	91,000
Wilcoxon W	211,000
Z	-1,415
Asymp. Sig. (2-tailed)	,157
Exact Sig. [2*(1-tailed Sig.)]	,176[b]

a. Grouping Variable: In which group are you enrolled?

b. Not corrected for ties.

b. Ranks for question 17 of both group 1 & 2.

Ranks

	In which group are you enrolled?	N	Mean Rank	Sum of Ranks
What grade would you give working in the GatherTown environment	12 hours per week in GatherTown	15	14,07	211,00
	3	17	18,65	317,00
	Total	32		

C. Descriptive Statistics for both group 1 & 2.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
What grade would you give working in the GatherTown environment	32	6,03	1,750	1	9
In which group are you enrolled?	32	2,06	1,014	1	3

I. Group grades.

Group 1 represents group A & B (fully online) and group 2 represents C & D (hybrid).
Team assignment 1 represents the first team assignment and team assignment 2 represents the final team assignment.

a. Group grades descriptives.

Descriptives

	Group			Statistic	Std. Error
Team assignment 1	1	Mean		12,641	,3485
		95% Confidence Interval for Mean	Lower Bound	11,946	
			Upper Bound	13,336	
		5% Trimmed Mean		12,714	
		Median		12,000	
		Variance		8,623	
		Std. Deviation		2,9364	
		Minimum		,0	
		Maximum		17,5	
		Range		17,5	
		Interquartile Range		4,0	
		Skewness		-,878	,285
		Kurtosis		3,518	,563
	2	Mean		13,107	,3712
		95% Confidence Interval for Mean	Lower Bound	12,367	
			Upper Bound	13,848	
		5% Trimmed Mean		13,175	
		Median		13,250	
		Variance		9,644	
		Std. Deviation		3,1055	
		Minimum		6,0	
		Maximum		19,0	
		Range		13,0	
		Interquartile Range		2,5	
		Skewness		-,520	,287
		Kurtosis		,585	,566
Team assignment 2	1	Mean		22,85	,690
		95% Confidence Interval for Mean	Lower Bound	21,47	
			Upper Bound	24,22	
		5% Trimmed Mean		23,24	
		Median		24,00	
		Variance		33,790	
		Std. Deviation		5,813	

		Minimum		0	
		Maximum		30	
		Range		30	
		Interquartile Range		8	
		Skewness		-1,349	,285
		Kurtosis		2,292	,563
	2	Mean		28,57	,369
		95% Confidence Interval for Mean	Lower Bound	27,84	
			Upper Bound	29,31	
		5% Trimmed Mean		28,52	
		Median		29,00	
		Variance		9,524	
		Std. Deviation		3,086	
		Minimum		24	
		Maximum		34	
		Range		10	
		Interquartile Range		4	
		Skewness		,234	,287
		Kurtosis		-,727	,566

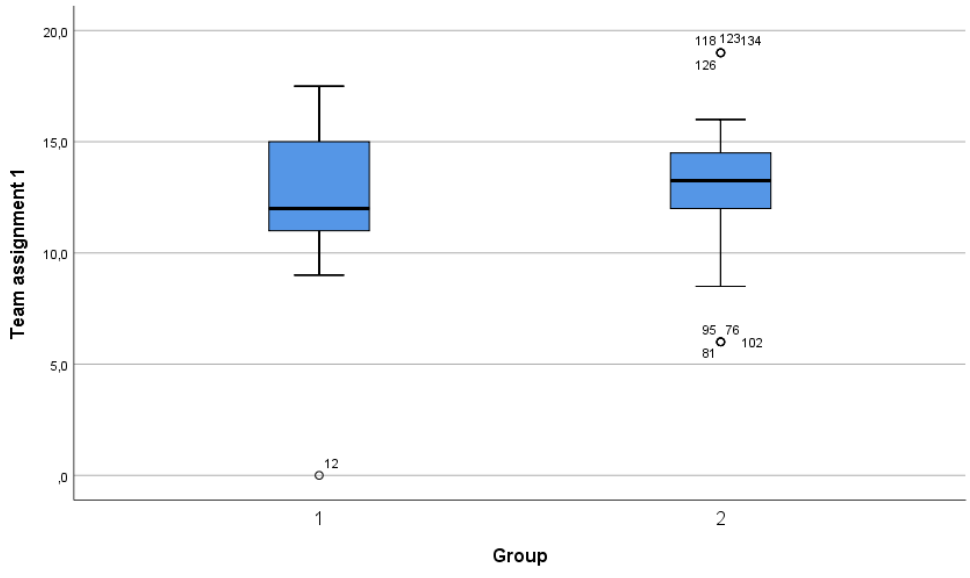
b. Group grades tests of normality.

Tests of Normality

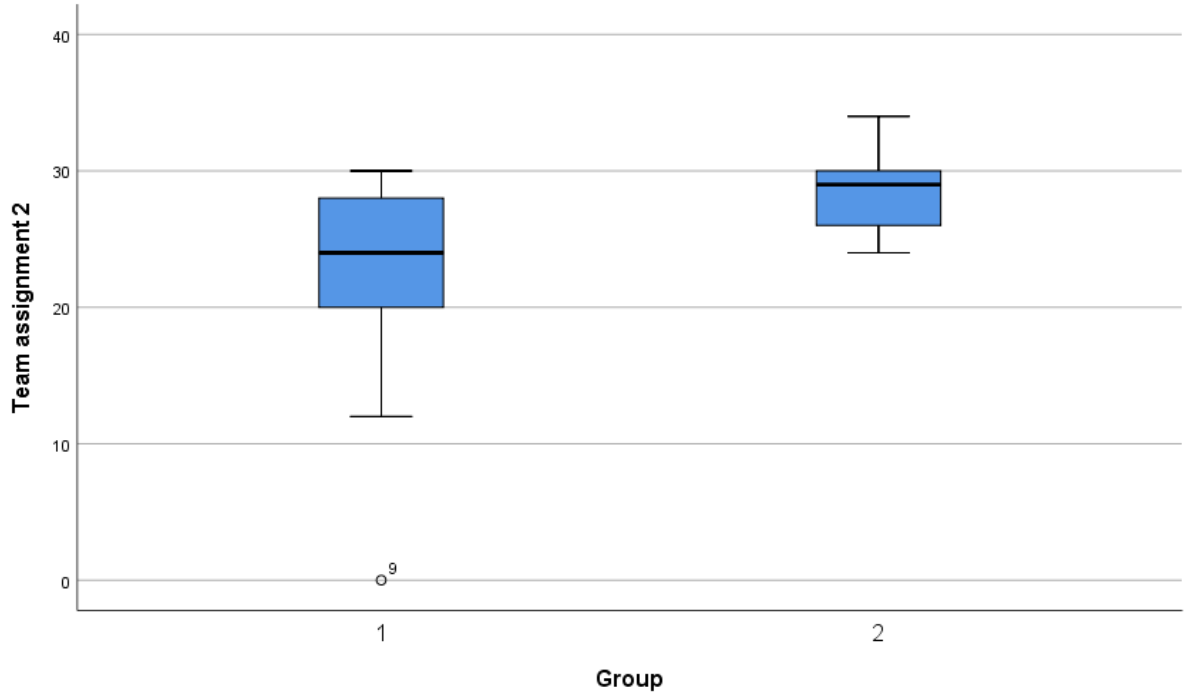
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Group	Statistic	df	Sig.	Statistic	df	Sig.
Team assignment 1	1	,133	71	,003	,910	71	,000
	2	,201	70	,000	,920	70	,000
Team assignment 2	1	,215	71	,000	,872	71	,000
	2	,179	70	,000	,895	70	,000

a. Lilliefors Significance Correction

c. Boxplot for the first team assignment.



d. Box plot for the final group assignment.



e. Ranks for team assignment 1 and 2.

Ranks

	Group	N	Mean Rank	Sum of Ranks
Team assignment 1	1	71	66,99	4756,00
	2	70	75,07	5255,00
	Total	141		
Team assignment 2	1	71	48,50	3443,50
	2	70	93,82	6567,50
	Total	141		

f. Mann-Whitney U for team assignment 1 and 2.

Test Statistics[a]

	Team assignment 1	Team assignment 2
Mann-Whitney U	2200,000	887,500
Wilcoxon W	4756,000	3443,500
Z	-1,181	-6,660
Asymp. Sig. (2-tailed)	,238	,000

a. Grouping Variable: Group