

MASTER THESIS BY XINYU HUANG

DESIGN FOR FUTURE DDL WORKPLACE



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1. INTRODUCTION

BACKGROUND

A physical work environment is essential for creating and supporting different activities in the workplace, not only for work performance but also for physical and mental wellbeing. Studies have been conducted on the influence of the working environment on work performance and people's wellbeing since the 1950s. Most of these studies have been published in the domains of ergonomics and human factors or in historical papers on the office environment (Katja, 2019). In recent years, motivated by increasing demand for wellness-focused design, companies and organizations are putting more effort into investing in properties that improve employee's performance while enhancing their wellbeing in the workplace (Zack, 2019), exploring opportunities of new emerging technologies. The same applies to universities where they always seek for new approaches. Students are more willing to adapt to changes and to participate in experimental setups.

CONTEXT

Delft Design Labs

"We unite scientists, students and societal partners to catalyse knowledge development and design innovation."

Delft Design Labs (DDL) is an initiative of the TU Delft Faculty of Industrial Design Engineering (IDE). DDL provides platforms for the integration of science, design, and innovation. With cross-disciplinary research and design explorations, Labs create state-of-the-art thematic knowledge with particular relevance to society. They function as creative hotspots that support and promote collaborations between researchers, students, and societal partners. (<https://delftdesignlabs.org/>)

DDL workplace

DDL offers multiple opportunities for student participation and master thesis project is one of them. Working on a graduation project is a challenging time and a graduation lab workplace should be an environment that can help.

This project is focused on designing for the future Delft Design Labs workplace, which is being used by students who are working on their graduation projects for Delft Design Labs.

During the preliminary investigation I noticed that the workplace has a typical open office layout and the students are provided with the workplace with flexible working times and working spots. However, these doesn't make the workplace a

generic co-working space, it has its typical characteristics. First of all, students who work at the workplace are all working on their graduation projects, which have a duration of 20 weeks. Based on different start times, students who work at the workplace are dynamic, which makes it difficult to develop relationships. Secondly, master thesis projects are personal projects and all students have different study directions and focus areas. The lack of scientific background makes it difficult to cooperate with each other. This also leads to the third character: some students are from the same design lab while others are not. Students from the same lab have more insights about each others project, which makes it easier for them to collaborate.

Due to the unique characters of DDL workplace, it is important to explore the current workplace and the user group as a start point of the project.

ASSIGNMENT

Design brief:

The original provided project brief was:

“Design the future Delft Design Lab (DDL) workplace.”

This envelopes a wide subject in which the overall working environment and human interactions need to be analysed. As a means to converge it to a specific design assignment, a preliminary research including literature and observation was done.

From the observation, the current DDL workplace is more perceived as a place to do focused work. However from the intended vision of the workplace, it was also a place where students could exchange ideas with peers from their own and different labs. The open office layout didn't help much with promoting face-to-face interaction inside the workplace. This result was also corroborated from research done by Ethan Bernstein and Ben Waber (2019).

By experiencing working in the workplace, I found that the basic needs during work were well supported, such as sufficient personal space, adjustable chair, and facilities nearby. However, working on a graduation project is such a challenging time that the mental support is even more important to graduation students. From a study conducted by Evans et al. (2018) showed that students who are working on their graduating, are more likely to experience depression and anxiety. Presumably, more than six times as to the general population.

Therefore, how to design a physical environment that can support the mental wellbeing of the graduation students is a very meaningful and ambitious topic. The initial project assignment led to an updated assignment:

“Design the physical environment of DDL workplace to support student wellbeing in the workplace.”

Design scope:

The physical environment can be described as anything that a user can experience physically through feelings, such as touch, smell, sight, hearing, and/or taste.

The wellbeing refers to mental wellbeing of the students who work on graduation projects for DDL. The wellbeing refers to mental wellbeing in this project, which will be achieved by balancing autonomy(doen things one's own way), relatedness(being able to have personal connections with others), and competence(having control over the environment and one's skill) during graduation project.

Ergonomics will not be fully considered; e.g. the perfect ergonomic chair will not be researched or designed.

2. APPROACH

Figure 1 shows a simplified visualisation of the design process. The project started with understanding the assignment and literature research to define the scope of the design. From this it became clear that further research was needed to determine what kind of value should be supported in the workplace.

I used a dual approach during the research phase of the project: a top-down(desktop research) approach and a bottom-up(user research, which consists of three different parts: survey, observation and interviews.) approach. Desktop research provides the general directions/possibilities of a coworking place. However, it is lacking on how these directions/opportunities are actually relevant to the context of DDL. Therefore additional user research was needed. With user research, the situated needs of the current users were looked into. Next to this, the information and data were turned in to main insights in the form of insight cards for the upcoming design phase.

The design phase started from diving into the design opportunities and conceptualising. After the evaluation, I chose to combine the initial concepts to a final concept. The final concept was developed further into the final design.

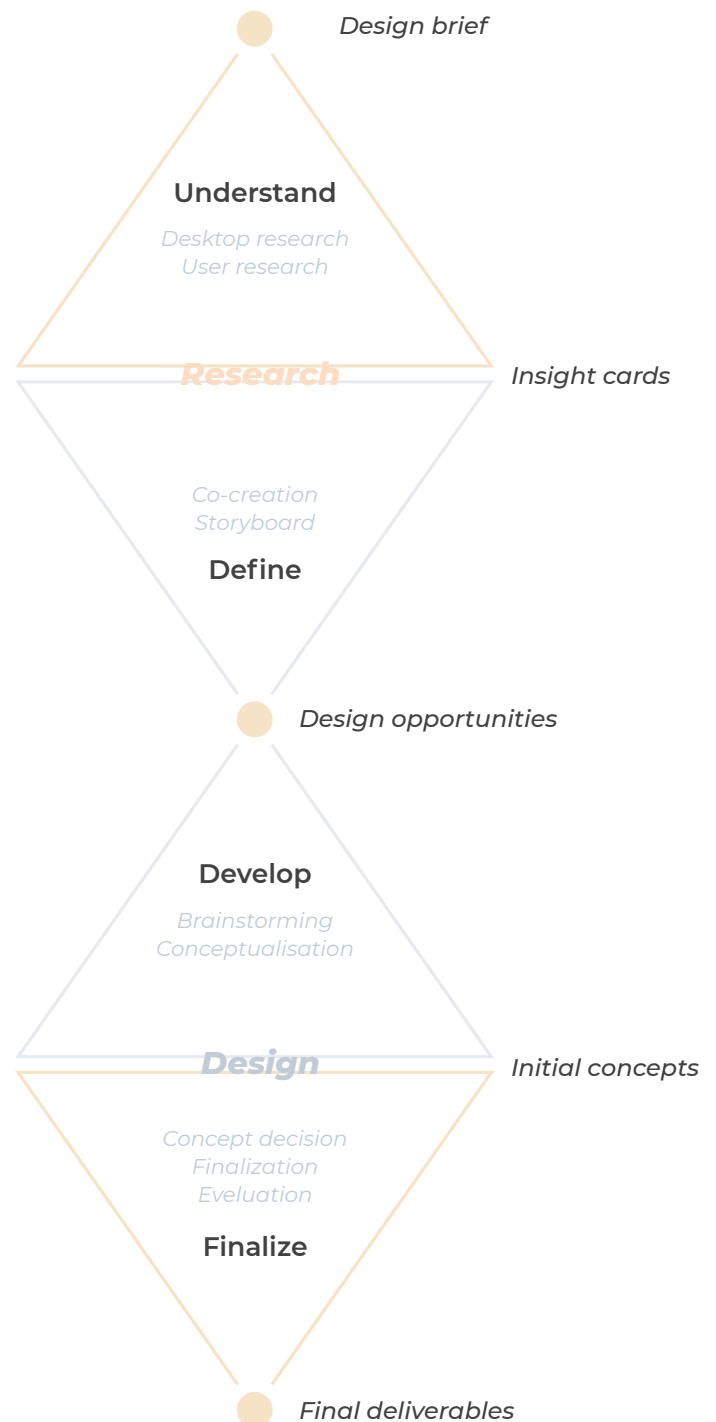


Figure 1. Visualization of the design process

3. UNDERSTANDING DDL WORKPLACE

As I mentioned in the Introduction chapter, it is important to get a sense of what the current DDL workplace is like, including the physical environment, the user group and the interactions between users and the environment.

RESEARCH METHOD

Online survey

In order to get to know the user group, I distributed an online survey. An online survey is an easy way to reach more people. The result will be less biased answers or even more honest. The survey was sent to 30 students who are working on graduation projects for Delft Design Labs via email, and 27 valid questionnaires were collected.

The survey focussed on gathering basic information of the students, such as which lab do they come from and how often do they work in the workplace. To get a better understanding of students using the DDL, questions like “Why do you come to DDL workplace to work?” and “How do they think the workplace could be improved?”, were asked. Furthermore, the questionnaire gathered information about interactions in the workplace. The complete survey can be found in Appendix.

Observation

To further investigate the current workplace, I did observations. Observations can reveal natural behaviour of people without their own awareness, which may be influenced by the space or people around them. I worked in DDL workplace for a day to get a

feeling of the space. Mainly observing the physical environment of the workplace and activities of the students to gain observable knowledge.

Examples of the focus of observations are ‘What do they experience in the workplace in terms of physical elements?’ and ‘What daily activities do they do in the workplace, what interactions do they have with the others and the environment?’. It aimed to get a sense of what is going on in the current DDL workplace in terms of user activities.

Interview

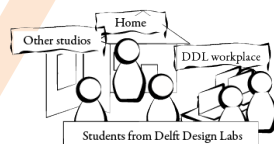
Due to the COVID-19 situation, students had to stay isolated at home, which became a big challenge for me to continue my project. However, it also gave me the opportunity to think out of the box: Will student miss DDL workplace when working from home? How can I support the user group even when they are away from the workplace? Therefore, I conducted online interviews with 8 students who are working on DDL graduation projects. Interviews often yield valuable in depth insights. An interview is more dynamic and focused on the personal needs. One can dig deeper into an issue and maybe find the root of the problem.

Focus of these interviews was to understand what do they value the most of DDL workplace, what problems and difficulties they encounter when working on graduation projects, and what support is missing when they are working alone.

Desktop research

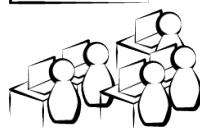
To get more knowledge on what kind of workplaces exist, desktop research was the quickest way to do so. To start off, I looked into 'university workplace' by searching through Google. Looking around through Google Scholar to see what kind of studies were done to improve a workplace. Afterwards, to compare different workspaces, a competitive analysis was done to discover existing strengths and weaknesses of shared (student) workplace. Also for finding where the opportunities might lie for improving the DDL workplace.

The figure on the right shows an overview of the research phase. The research results will be explained in this chapter from three aspects: physical environment, user group and interactions.



Observation

DDL workplace



- What is the workplace like?
- What do they experience at the workplace in terms of physical elements?
- How do the physical elements influence the students working experiences?

Physical environment

Survey

- How do you think the workplace can be improved?

- What are the existed strengths and weaknesses of student shared workplaces?

Coworking space



Student shared workplace



Desktop research

- How DDL
- Who have envi

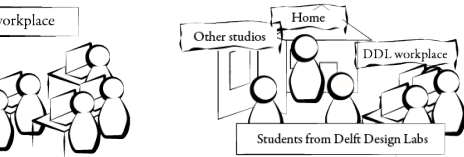
DDL w



OVERVIEW

What are the students using the workplace?

What interactions do they have with the others and the environment?



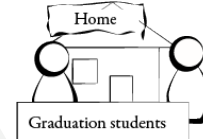
Observation
Interview
Survey

Interaction

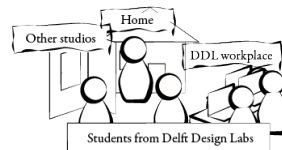
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- What do you miss about working at DDL workplace/in the faculty?
- Under the current situation, how is it going with your graduation project?
 - What's the most difficult part?
 - What's the good part? Is there any positive side?

Interview



Survey



- Who are they?
- Why do/don't they come to DDL workplace to work?

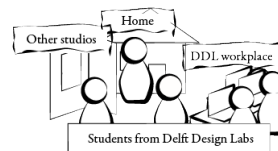
User group

- What activities do they have at the workplace?

Observation



- Why do/don't they come to DDL workplace to work?



Interview

Figure 2. Overall view of the research phase

PHYSICAL ENVIRONMENT

The DDL workplace consists of three areas: the main area, a meeting room and a small concentration room.

The main area has a typical open office layout, which has fourteen working spots. It is the main working area for students to do project related activities. Lockers are also provided for storage. The main light source for this area is artificial lighting. Bright colors such as green and orange are distributed in the area. There are curtains for separating the main area into two, however they are seldom being used.

The meeting room has several chairs and one large meeting table, which takes most of the space. Students are able to book it for meetings.

The concentration room has the smallest size, which can only accommodate one to

two students at the same time.

What do students experience at the workplace in terms of physical elements?

Through the observation, I listed the physical elements of the workplace, from the ones originally provided by the workplace such as tables, chairs and lighting to the ones brought by the students who worked there such as post-its, prototypes and coffees.

How do the physical elements influence the students working experiences?

Based on the observation and my own experience, I categorized the elements into five kinds and scored how much influence does each of the kinds have on students' working experience. The results are shown in the radar chart below. I found that among the five physical elements, sight and



Figure 3. Delft Design Lab workplace

hearing are the most influential ones for the working experience in the workplace. Touch and smell is less influential and taste almost has no influence. When looking into the elements, they can be divided into two kinds: the ones contribute to the constant physical environment and the variables of the physical environment.

Elements contribute to constant physical environment:

The first one is closely related to the interior design of the workplace. White artificial lighting does provide good and clear working conditions, but lacks the dynamic feeling compared to natural light. Students may lose the sense of time. It is nice to have bright colours, which contribute to a more creative and lively environment. The desks are large so it provides the students enough space for design work, such as drawing and prototyping. Desk dividers provides privacy to some extent

Variables of the physical environment:

The second one is more related to the students' activities at the workplace. Just like a coin has two sides. On the one hand, being in the workplace, the other students will motivate you to work. On the other hand, being with many students might also be distracting due to chatter or movements.

In a nutshell, the sight, hearing and touch can be improved by designing the constant physical elements; The sight, hearing and smell are more related to variables of the physical environment. Therefore, different factors will be considered when choosing the design direction in the later phase.

- Elements contribute to constant physical environment
- Variables of the physical environment

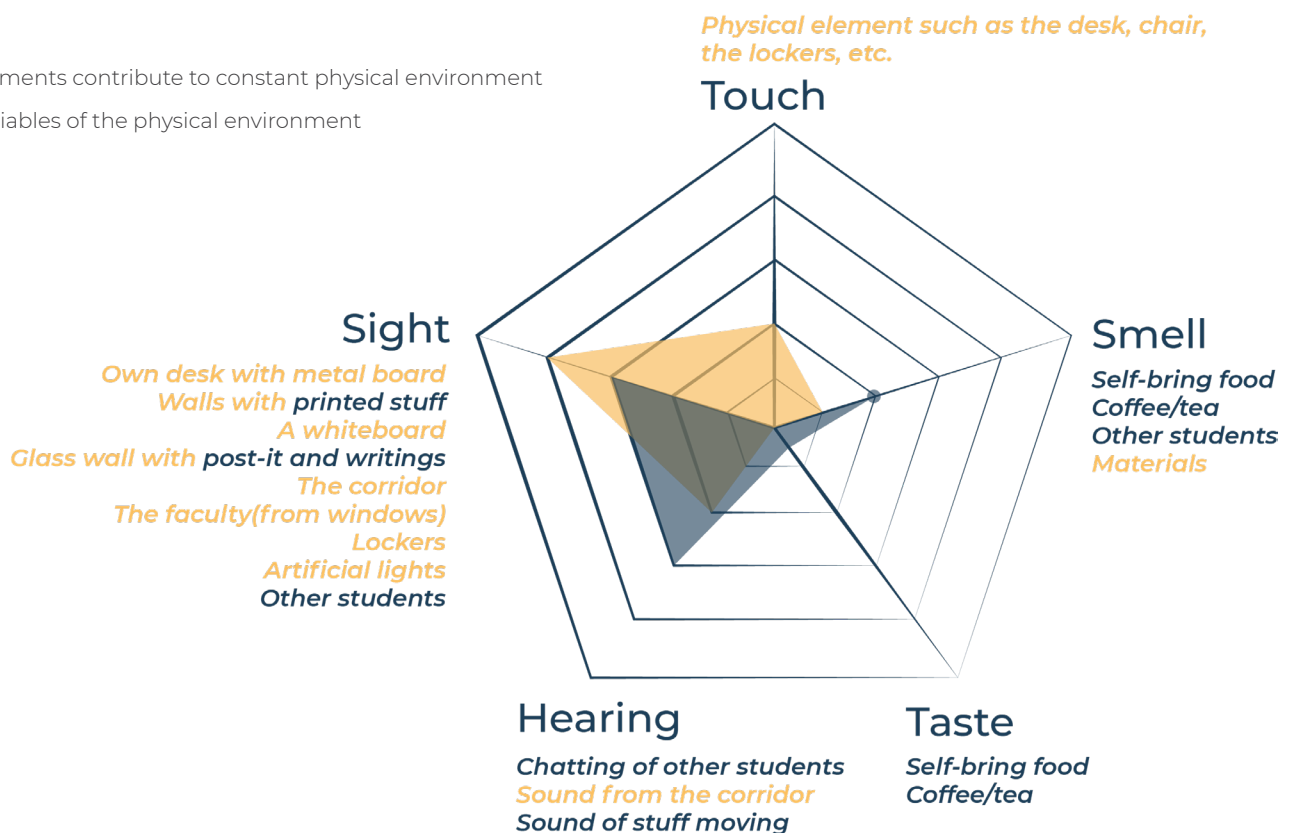


Figure 4. Influential physical elements of DDL workplace in a radar chart

How can the physical environment be improved?

Survey

The figure below shows the result of the survey. The different sizes represents for how often they were mentioned. The whiteboard, coffee machine and plants were mentioned the most often, and these three elements are very common in shared workspaces.

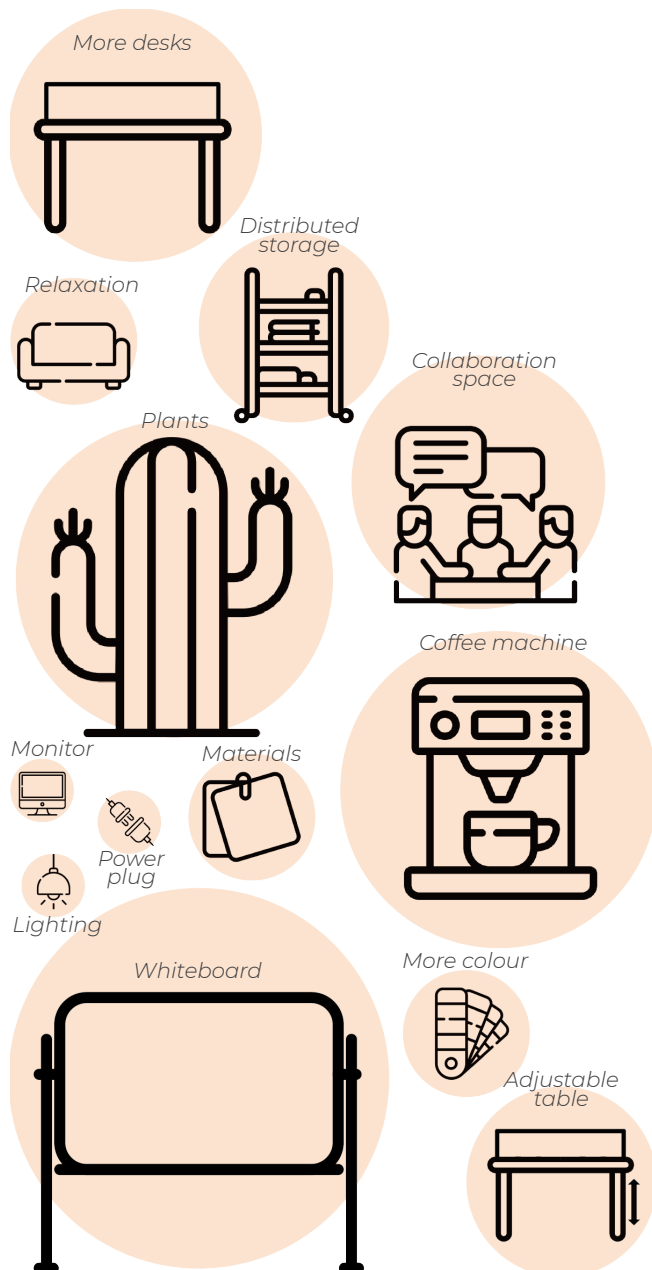


Figure 5. Visualized survey result

Whiteboards can encourage conversation among students as people are naturally intrigued by what they see on whiteboards. It opens channels for communication and collaboration. Coffee is like the fuel of designers. It has already become a culture that cafes are the place where collaboration and conversation happen. Plants are also helpful for creating a creative work environment and benefiting student wellbeing. More desks and collaboration space were also mentioned few times, which means an extend and more functioned space is needed in the future.

Desktop research

The workplaces were classified into three typical kinds: open space, studios and silent room.

Open spaces are the spaces that students have the most freedom while working. Students can do many different kinds of activities and have easy access to the others. However, it's also easier to get distracted and influenced by the environment.

Studios are spaces that contain limited number of people and space. Working in a studio provides students with more privacy and less distractions. Students can also personalize the space based on their needs when using. However, studios are not always available for every student or student group.

Silent rooms are spaces that enable students to do highly focused work. Students can have the best concentration when working in a silent room. However, this kind of spaces don't support other kinds of design related work.

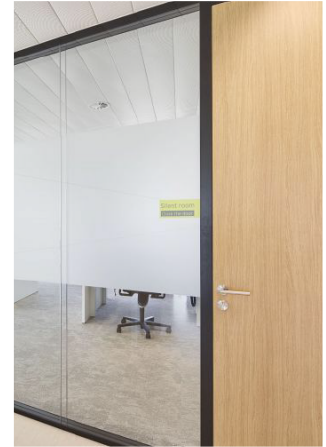
Workplace

Open space

Studios

Silent rooms

Usage scenario



Needs supported



SWOT

● STRENGTH

- access to facilities
- free for discussions
- different functional areas
- open views

● WEAKNESS

- more distractions
- unexpected interruptions

● OPPORTUNITY

- divisions for different working preferences

● THREAT

- preferences might change frequently
- cost increase

● STRENGTH

- more space for putting materials
- free for discussions
- less distractions
- privacy

● WEAKNESS

- less access to the others
- not available for everyone

● OPPORTUNITY

- booking beforehand
- sharing system

● THREAT

- extra work
- privacy related concerns

● STRENGTH

- privacy
- best concentration

● WEAKNESS

- less access to the others
- not available for everyone
- less freedom

● OPPORTUNITY

- booking system
- adaptability

● THREAT

- extra work
- cost increase

Table 1. Summary of the desktop research result

After analyzing the different student shared workplaces, I found that they could be placed and categorized in a coordinate system. The horizontal axis indicates flexibility on the left end and stability on the right end. The vertical axis indicates Publicity on the top end and privacy on the bottom end.

Flexibility vs Stability

When working in an openspace such as the main hall of IO faculty, students rarely know who is going to seat next to him/her. Your working peer possibly changes everyday. However when working in an assigned studio, you always work with the same group of people. Connections will be built over time.

Publicity vs Privacy

At public workplaces, people can easily check with your work, discussions can be done without much concern with the others. However when working in a silent room, your sensitive information will be protected.

From the figure it shows that all student shared workplace are placed in the second, third and fourth quadrant. The current student shared workplaces are more focussed on flexibility. Under this condition, it's difficult to build up connections with peers when working. This might be an opportunity for DDL workplace. The physical environment and relatively stable user group is a good start point to build a workplace where the space is as public as an openspace but has the stability of an assigned studio.

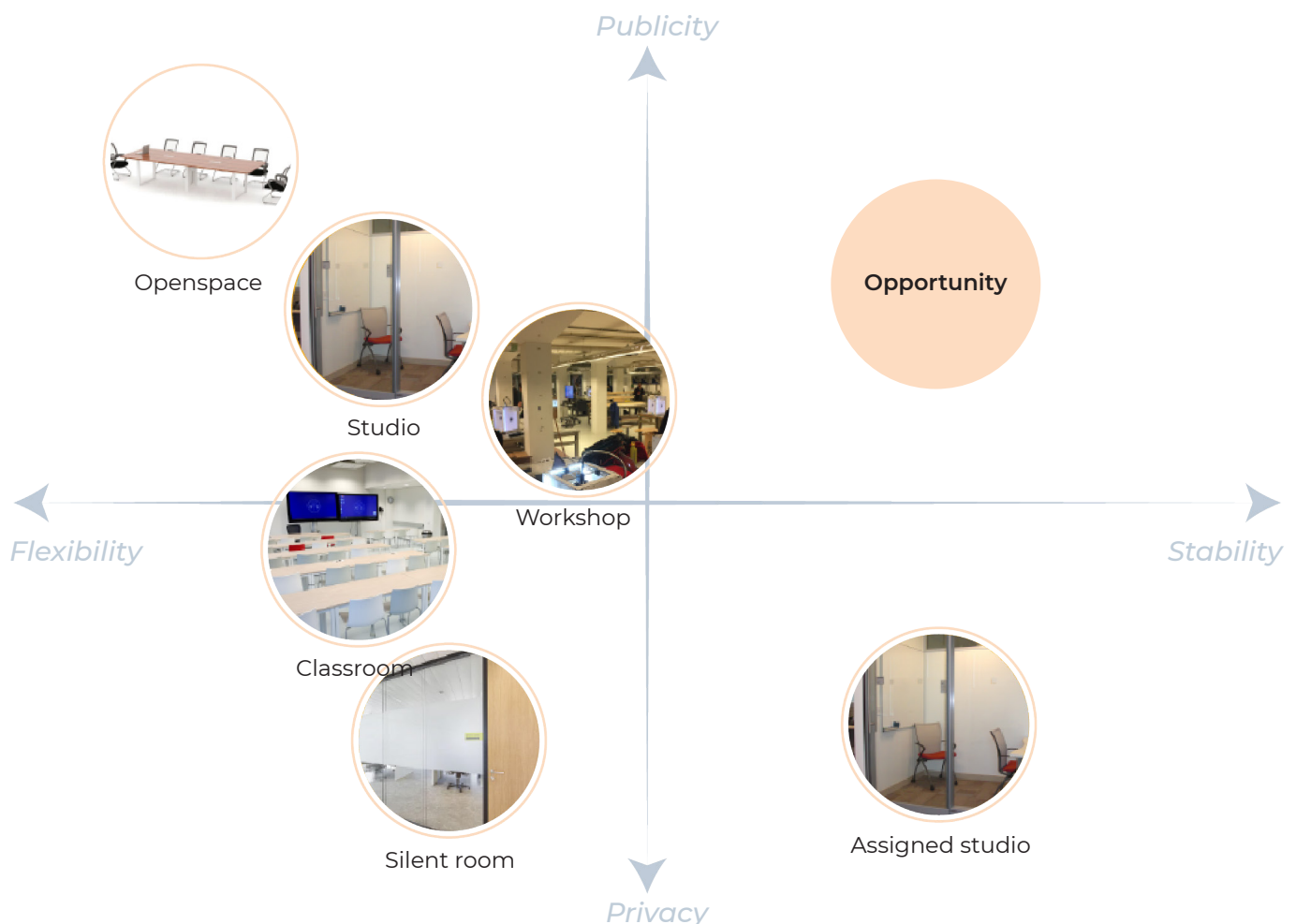


Figure 6. Cluster of typical student shared workplaces

USER GROUP

Background

The users of DDL workplace were analyzed from two perspectives: commonalities and differences.

Commonalities:

"In our lab we have quite the feeling of 'being a real member' of the lab. Especially we work on a quite 'unusual' topic(sound) it helps to exchange knowledge on what programs could be used to achieve certain prototypes/results."

"I think that working with other students is an inspiration. Especially working closely together with other students from my lab."

"I enjoy the working mood in the DDL space more than in other environments, this combined with the peer support that somehow is possible to have with other students there."

Delft Design Labs: All the students are working for Delft Design Labs, some are even from the same design lab. This enables the students to exchange knowledge and experience with peers. Peer support is one of the most valued values of the students when working in the workplace. Peers can offer emotional, social and practical assistance to show their support. It helps others to do the their work and facilitate their wellbeing.

Graduating students:

"The fact that the space is shared by graduates provides a professional working environment, with little distraction. On the other hand I can relate with a number of the 'colleagues' that share the space,

being able to share trials and tribulations concerning the graduation projects."

All the users are working on their graduation projects. Most of the projects were group work or supported by classmates during the education, but the graduation process is different. Working on a graduation project is a challenging time. It requires students to prove autonomy by planning and managing the whole project. Sometimes students will miss relatedness to others and questioning own competence regarding skills and knowledge. The workplace provide the students a working environment with students who are in similar situations, which is a good foundation to support student wellbeing and help them through this challenging time.

Differences:

"Working in a medical environment can sometimes be challenging (getting participants/ethical applications etc.) and getting advice/sharing experiences from students who are in the same position helps to find a way that works."

Different Design Labs: As mentioned above, all the students who work in the workplace are from Delft Design Labs. However, there are more than 14 different labs and the different lab has different defined knowledge domain. Therefore, the students has different focus areas for their graduation projects. This explains why some students are more connected than others.

Different graduation progress:

"It would be nice if we are able to support each other, but that would also take time from our own projects."

"More collaborations would be nice. However, this might be better in a different room since silence and concentration is also valued for some students."

Although all the students are working on their graduation projects, they are at different stages. Graduation projects are long-term projects and are planned differently by project owners, which means students might have different design activities and dilemmas when they are working together.

Personas:

Based on the online survey and interviews, I created three representative personas for communication and design in the later phase. Personas will help me to get a better understanding of the user group. Their needs, reasoning and behaviour within the DDL. The personas will not cover all the users, but will give a good representation of certain groups.



Tom 25
IPD

Play Well Lab

At his start point of his graduation project

Motivation for using DDL

Quite, not as depressing as other quiet spaces. I feel part of something (sort of), motivated to work on my project

Behaviour when using DDL

When working at the workplace, I feel a social rule so not much conversation with people to go for a coffee outside and have bi-weekly 'lab-rat' meetings that



Ann 24
DFI

Museum Futures Lab

Just finished her midterm meeting

Motivation for using DDL

Quiet, always own table, good concentration, people in the same phase in one room

Behaviour when using DDL

I greet them when I arrive in the morning, casual conversation with the few people, we share infos on the projects if we are in the field.



Ben 23
SPD

End of Life Lab

Prepare for greenlight of his graduation project

Motivation for using DDL

Better concentrate in this space, I can talk to my mates and ask for their insights regarding the project

Behaviour when using DDL

At this phase I prefer not to interact too much because I always end up listening or helping others to have to finish my own stuff. So I struggle to talk to friends who worked there as well and talk to you. So it's maybe even better to

INTERACTIONS

How are students using the workplace?

A regular workplace:

From the survey, most students come to DDL workplace to work regularly (3-5 days a week). Students want a designated workplace during graduation project. They prefer to separate work and home so that they can work with less distraction and also fully relax at home after working. Going to the workplace on a regular basis gives them the feeling of “going to work”, which makes them feel more motivated and concentrated when working in the same space. However, found from the research, the workplace can be too crowded or not fully used sometimes. Students are not certain about whether they can get a working spot.

“Also because there aren’ t desks for everyone, I can’ t put my stuff in a certain spot and kind of am just roaming around, hoping the desk is there the day I want to work there.”

A creative character

“You can leave your materials or stick materials to the wall etc. This gives the room a creative character.”

A design project always asks the students to be creative and creative mind needs creative environment. Students like the opportunity to build their own surroundings. Tailoring the space based on their needs gave them creative freedom and comfort which activated their inner design genius. Students are more likely to feel inspired when they are surrounded by inspirational materials such as moodboards, prototypes and collages.

Quotes

“Having a bottom-up approach is great (e.g. being able to suggest topics and such) but then actually ‘spontaneously’ arranging it is a hard thing to do. I feel like we need a student assistant or at least a (rotating) responsibility in organizing this.”

Quotes

“with some fellow students I have not yet spoken, this due to them (and me also) giving off an aura of being very pre-occupied and therefore not approachable.”

Quotes

“It would be nice if we are able to support each other, but that would also take time from our own projects..”

Figure 7. Personas

Focused work:

"It is a good place to do focused work."

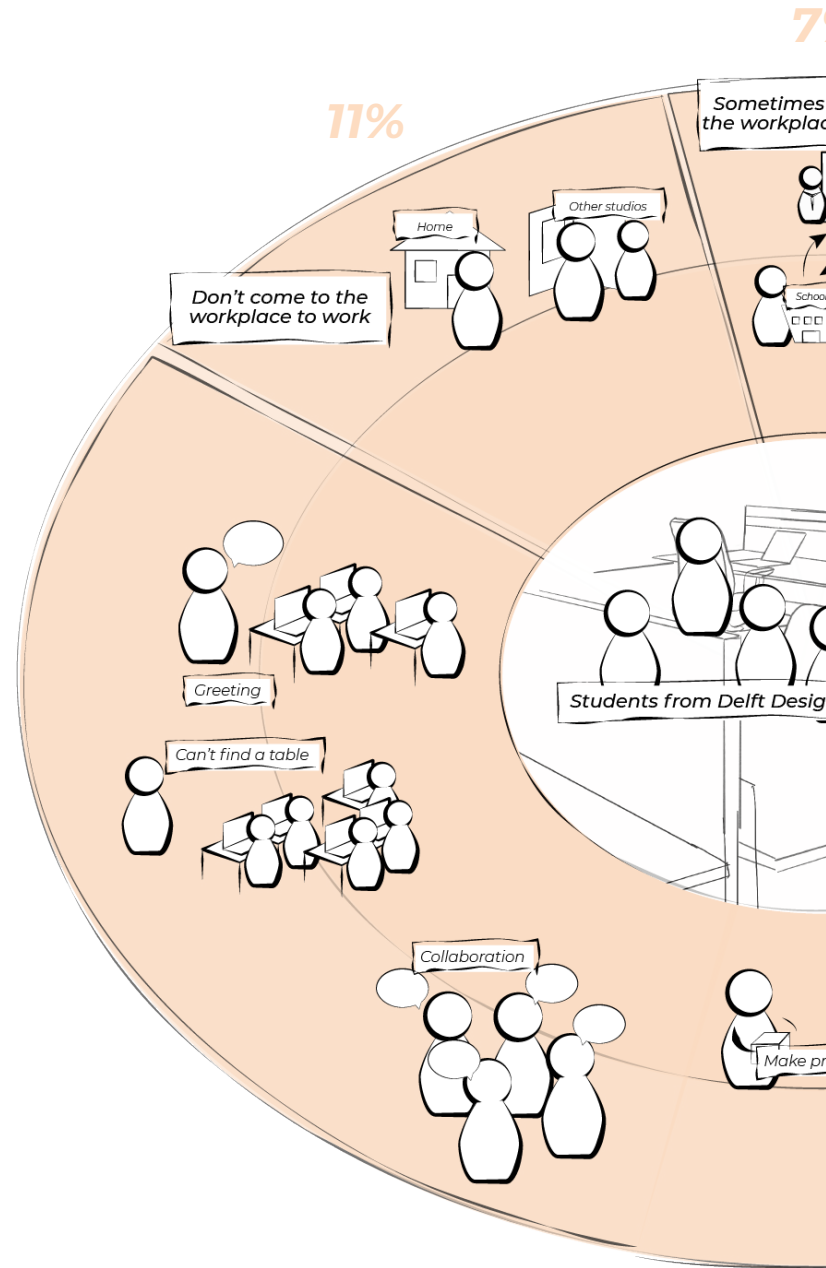
Compared to other workplaces in the faculty such as the main hall and big studios, DDL workplace is more quiet and less crowded. Peers working in the same space also motivates students to work more efficiently. Most students mentioned they had better concentration in the workplace.

No rules?

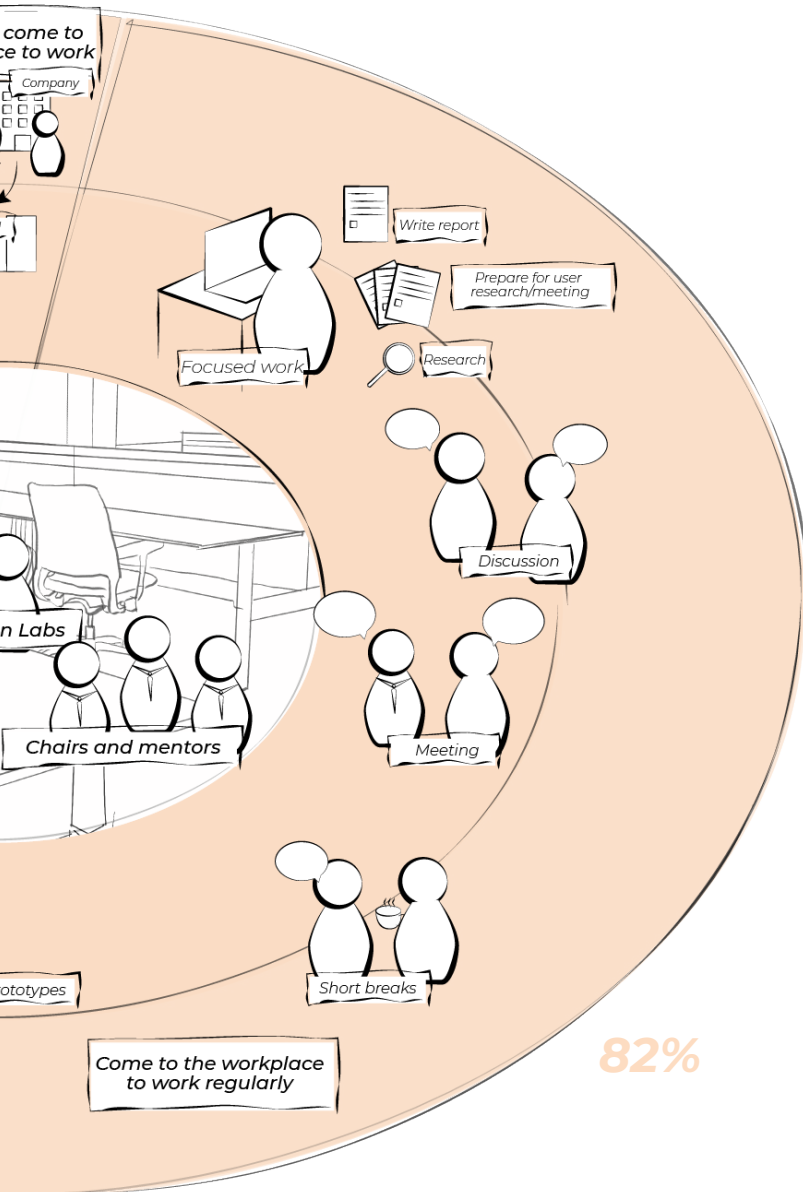
As mentioned above, the workplace is divided into three parts. Each of the area is being used differently. The main area has a typical open office layout which has fourteen working spots. It is the main working area of the workplace. The meeting room can be reserved for meetings with mentors. It was also being used for shooting videos during the observation. The concentration room was now not being used as some chairs were stored there.

"There is a small room that is not being used. It would be nice if that room would have some shelving to store larger stuff there, so the desks are less crowded. Or maybe a table to make simple prototypes on."

From the observation and survey, it can be found that students don't know the rules about how they should use the workplace. For example, although there is a clean-desk policy, there are still students putting project-related materials on the desks. Therefore, it is important to help students understand the unwritten rules of the workplace. And the different areas should be functionalized with students' most valued needs.



%



The social rule:

"Within the lab 'being quiet' is the social rule so not much conversation happens. I sometimes ask people to go for a coffee outside and then we talk for a bit."

As mentioned above, the workplace is quiet and many students value the quietness for focused work. Students have more concerns about interrupting others when working in the workplace. Therefore, the workplace is not the best place where to have discussions or collaborative activities. The interactions between students in the workplace are restricted and less meaningful.

What interactions do they have with the others and the environment?

On the left side an illustration is made to visualize the conducted research. The visualisation consists of an overview of different contexts and the user group related to DDL workplace. It is created based on a pie chart, but with more meaningful insights. From the research it was found that 7% of the people sometimes go to DDL to work. Sometimes indicates two days per week. 82% of the people work on a regular basis in DDL. Regularly indicates three to five days per week. Lastly, 11% of the participants never go to the workplace to work.

The center area shows the user group of DDL workplace. There are two rings outside of the center area. Students stand in different positions, which represents the closeness to DDL. Students that never go to DDL are the furthest from the center. Also, the different activities are also near or away from the center to show the relatedness to the working place. For example focussed work is almost the main activity within the DDL. While taking breaks or collaborating is often outside the DDL.

Figure 8. Overall view of different working activities of DDL members

What do students miss about the workplace when working from home?

Peer support:

"When I do team work we always check with each other what we' ve done and if there' s any question, it motivates me to finish my work on time. But when I work alone I feel less pressing."

"I miss the people around me, when we were sitting together studying I can ask them questions."

"I can' t start a video call whenever I want. And I might get the respond hours later."

As I also mentioned in the user group part, peer support is one of the most valued things for students when they are working in a shared student workplace. It not only motivates students to work but also enables students to ask for instant feedback on their work. Although there are multiple remote tools to communicate to others, the uncertainty of not knowing the person is available to help becomes an obstacle.

Access to experts and facilities:

"I can' t just walk in and ask the experts for help but have to email them. It' s way less efficient."

"I miss the printers and other facilities in the faculty. I' m now worried about the prototyping phase and user testing of my graduation project."

Working on a graduation project asks students to be able to manage a design project independently. However, support from others, especially from supervisors and experts, are very important. The graduation

project is still a learning process for the students. Therefore, easier access to the experts and supervisors help students to accomplish their projects in an efficient and time-saving manner. What's more, design work is usually accompanied by model making and user tests, which need a professional workplace to conduct.

Turbulent work flow:

"I feel more active when I work in the faculty, I sometimes walk around for coffee or a chat with others."

"I usually follow the faculty' s schedule. When there' s more people in the hall or when it' s getting more noisy, I know that it' s time for a break."

Workflow is influenced by the environment where the person works in. At home there is less distraction, other than procrastination. Sometimes students might lost the sense of time. While in the faculty, there are many "turbulent" factors. A friend could come up to you to have a chat. Suddenly there is lots of movement from a finished lecture and you might also want to have a short break. These will make working in such a space more dynamic and force you to take breaks more often.

CONCLUSION

Physical environment:

The current workplace consists of three parts: main area, a meeting room and a small concentration room. The main area is where most of the activities happen. The workplace provide the students with a professional working environment with standard lighting and facilities such as big tables and adjustable chairs. To create some creative feeling there is added bright colours in the space in the form of curtains, seats and lockers. Through a survey, it was found that most participants would like to add whiteboards, plants and coffee machines inside the DDL workplace to improve the working environment.

Through analysis it was found that touch, sight and hearing are the most triggered senses. These senses were taken into account during the design process. The students are satisfied with big working tables and the quietness of the workplace. The downside of the space is the lack of natural lighting and the uncertainty of availability of work spots. Lastly, the space is not suitable of certain activities but is inevitable. Direct changes to the space as a whole is not necessary nor brings the desired change.

To further compare DDL with existing working spaces, a competitive analysis was done to find the strengths and weaknesses of three typical kinds of student shared workplace: open space, studio and silent room. All of them have its ups and downs and might not be ideal for DDL workplace. DDL workplace should take the opportunity of combining publicity and stability to make the space provide enough openness but yet help to build stronger connections among students who work there.

User group:

All the students that are working at DDL

workplace, aim to get their graduation projects done within the given time.

As graduation is an individual project, it will be a challenging time for everyone. When working at the workplace, they motivate each other through peer support, which becomes the main advantage of DDL workplace. However, due to the intense project time and different time plan, it's difficult for students to develop stronger relationships or a sense of being supported in a community.

Interaction:

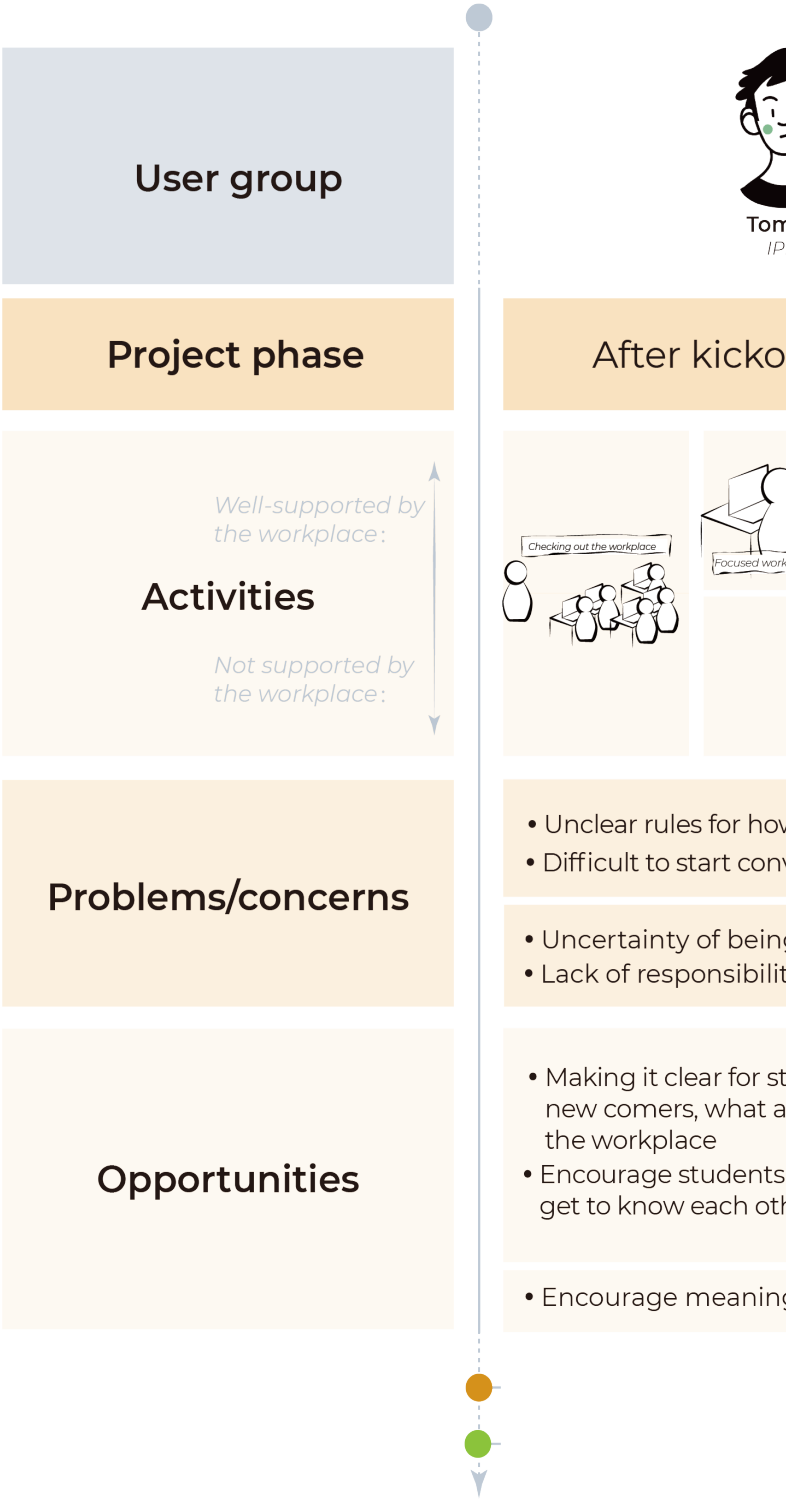
Most students come to DDL workplace on a regular basis, three to five times a week. Working in the space helps them split work from home. There are some rules such as clean-desk policy, to apply to working at the DDL workplace, but most students are not aware of them. This results in occupied desks and rooms used for other purposes than intended. In a word, students would like to use the workplace as a professional workplace but they lack of responsibility for the workplace.

Not interrupting others is an unwritten rule and some students are even afraid to disturb others. This leads to less interaction between students and it makes the space less meaningful. Also, due to the fact that everyone has different projects and different focus areas. It makes it easier for students from the same design lab to collaborate while harder for students from different labs to help each other out. The design activities are also different because of different project phases. In the current DDL, there is a lack of meaningful interaction because students don't know much about each others' graduation information. There is an opportunity to improve this issue. If students know what the others are doing, peers could

potentially help one another and so getting to know each other.

The DDL workplace wasn't being utilized as intended and its fullest potential, but students do need a shared working space to work efficiently. This became rather prominent when the COVID-19 came. Working at home does not give the same level of efficiency compared to working at a shared workplace. When working from home, the students miss the peer support and the fact that others working will motivate them to work as well. Direct feedback is something that has become more difficult as some people are not as easy to reach.

The research results were collected and made into insight cards for better communication. The complete insight cards can be found in Appendix B.



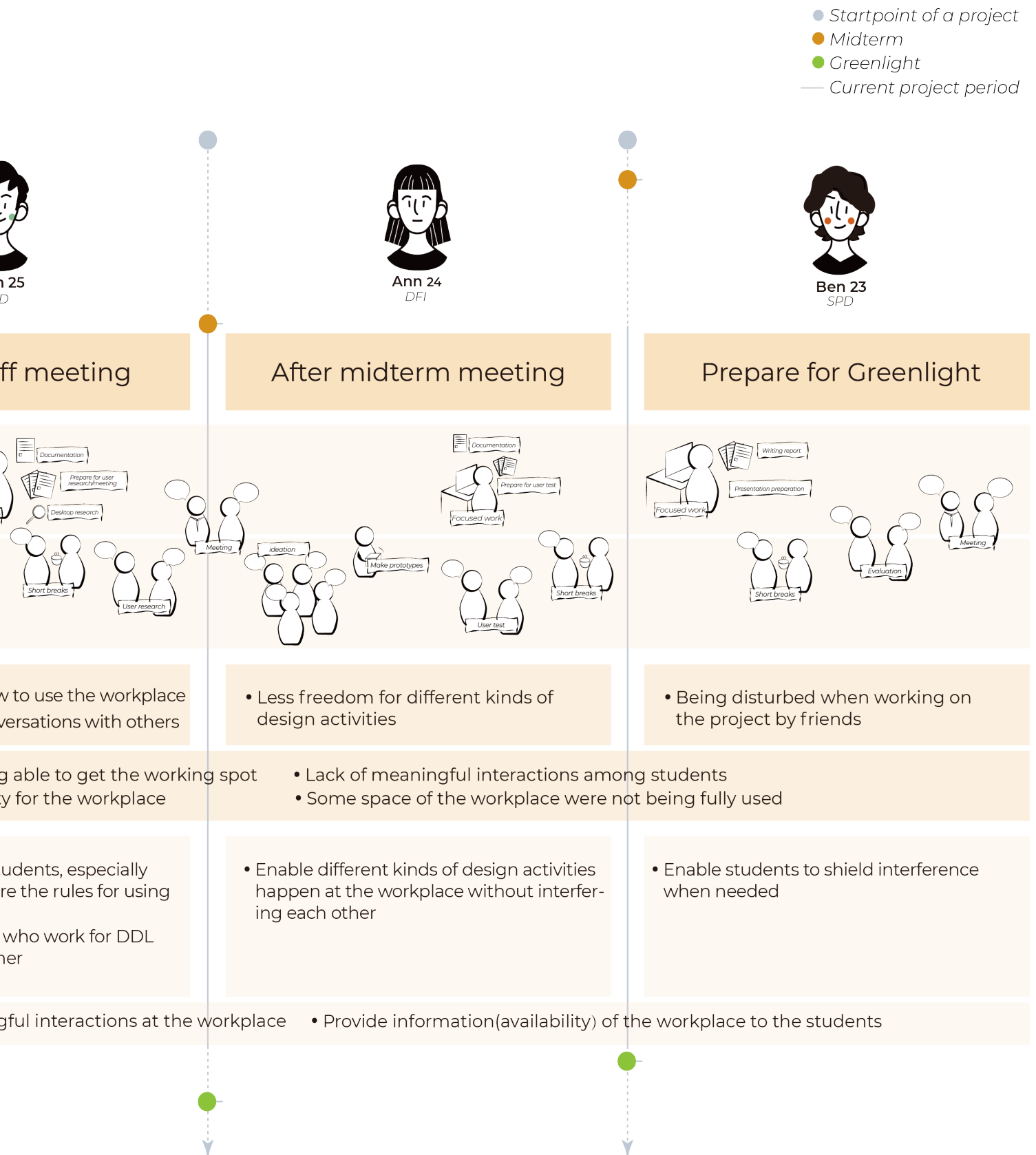


Figure 9. User experience at the current DDL workplace



SOURCE

Data/User wish or statement of need
/Observation

Insight

Insight

LITERATURE

Some spaces have a top-down type of gov designed ad hoc by an organization that o innovation process. The others respond t which were created by users motivated by develop a community of interest.

The DDL workplace is more of the top not really perceived as a collaborate p who work there.

LITERATURE

Co-working spaces are community-driven environments where co-workers can improve themselves with the help with other co-workers (Sykes, 2014).

In this community, co-workers can find other people, ideas and other resources, share experience, learn from each other and celebrate each other's successes (Moriset, 2013; Waters-Lynch & Potts, 2017).

LITERATURE

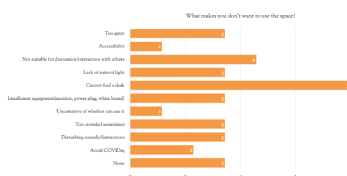
Users of co-working spaces value working in a co-working space because of casual small talk, knowledge sharing and brainstorming with other co-workers (Desmag, 2015).

OBSERVATION

The meeting room has been using for sho The concentration room has been using f

There's no clear rules about this wo might use it as what they think it's s

SURVEY



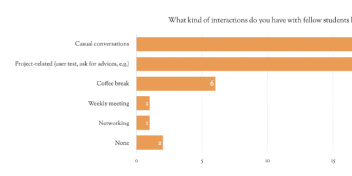
The current workplace is not always available for every student and sometimes the balance is off. It also doesn't support all the design-related activities.

SURVEY

"I know from a previous student who just is about to graduate, that he shared a table with someone that was always in the lab before him, even when he came early. Therefore, he felt as if he had no space to work/was not welcome. Maybe by adding a time-schedule for each table with a name, showing when it is who's desk."

Students want to feel welcomed and secured when working in the workplace.

SURVEY



Students do interact with each other but want to keep it simple and proje

SURVEY

"It would be nice if we are able to support each other, but that would also take time from our own projects."

"More collaborations would be nice. However, this might be better in a different room since silence and concentration is also valued for some students."

Collaboration and supporting each others is nice, but the concentration and focus on own project is also important.

INTERVIEW

"Once I was preparing for my meeting but someone was talking on the phone pretty loud. I know it was lunch time but I still want to work."

Students have different work time and preferences, which might interfere with each other.

INTERVIEW

"When I do team work we always check w we've done and if there's any question, it r my work on time. But when I work alone I

Expectation from the others help wit students to work more disciplined.

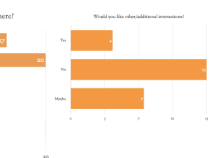
4. DESIGN FOCUS

ernance, which were
versees the
o a bottom-up logic,
a desire to share and

o-down type but is
ace by the students

oting videos(recently),
or storage.

rkplace, students
suitable.



r in the workplace
ct-related.

ith each other what
motivates me to finish
feel less pressing."

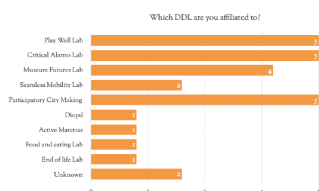
h motivating

LITERATURE

In spaces with a bottom-up logic, members are usually intrinsically motivated. However, in spaces with a top-down approach, motivating individuals to co-work and co-create does not always flow as a matter of course.

For DDL workplace, a strong motivation is necessary for a long-term commitment. Or shape it with a bottom-up logic.

SURVEY



Students who come to DDL workplace to work have different projects and focus areas.

SURVEY

"I enjoy the working mood in the DDL space more than in other environments, this combined with the peer support that somehow is possible to have with other students there."

"I think that working with other students is an inspiration. Especially working closely together with other students from my lab."

Students enjoy the peer support provided by the workplace.

INTERVIEW

"I miss the people around me, when we were sitting together studying I can ask them questions."

"I can't start a video call whenever I want."

"I might get the respond hours later."

People want instant feedback.

After the research phase, insights from different sources were collected. I found that graduation students' preferred work modes change over time and in various situations. How to support their needs while working also changes accordingly. Considering the time frame, I decided to narrow down the design direction.

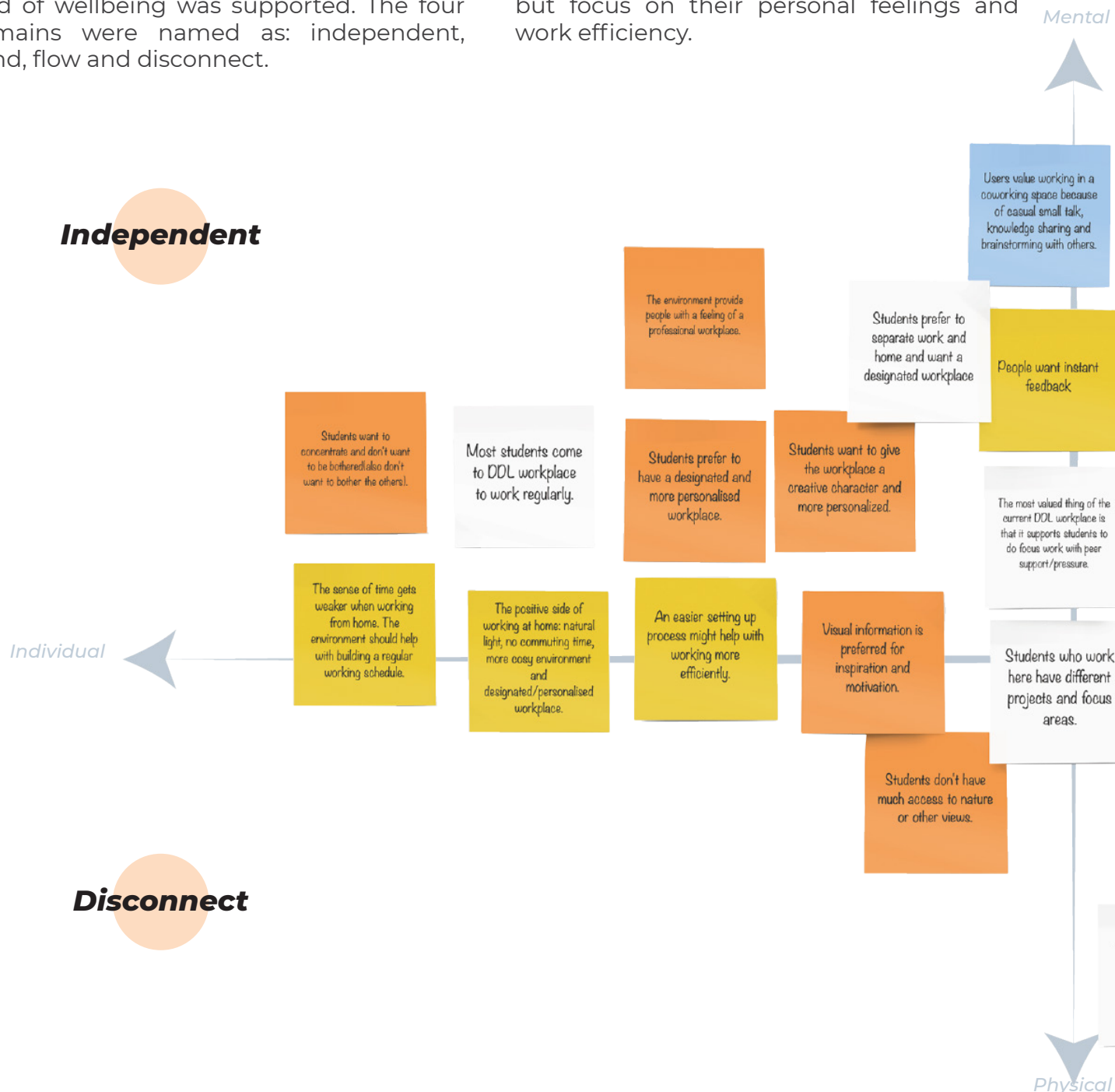
After choosing my design direction, key insights were selected. Based on the key insights, I defined the problems using a storyboard. Later on, I set design goals for leading the upcoming design phase.

Figure 10. Key insights for the chosen design direction

DESIGN DIRECTION

In order to categorize the insights, I placed the insight cards in a coordinate system of four kinds of work mode. The horizontal axis represents the relatedness to others while working, the vertical axis represents which kind of wellbeing was supported. The four domains were named as: independent, bond, flow and disconnect.

Independent: When students want this kind of work experience, they prefer less distractions and interruptions. They can finish their work efficiently themselves. They can feel the peer support from the others but focus on their personal feelings and work efficiency.



Bond: This kind of work experience provides students with peer support from each other and makes them feel motivated. They feel they are not only using the workplace but also “part of something”. They are willing to help each other and have consideration of others.

Flow: When students only care about the physical support for working, they focus on

the physical elements such as lighting, the size of the desk, and the facilities. They still have access to the others but they are just using the workplace and follow the workflow.

Disconnect: When students have no access to others, they can only rely on themselves. This is what students might experience when they are working from home.

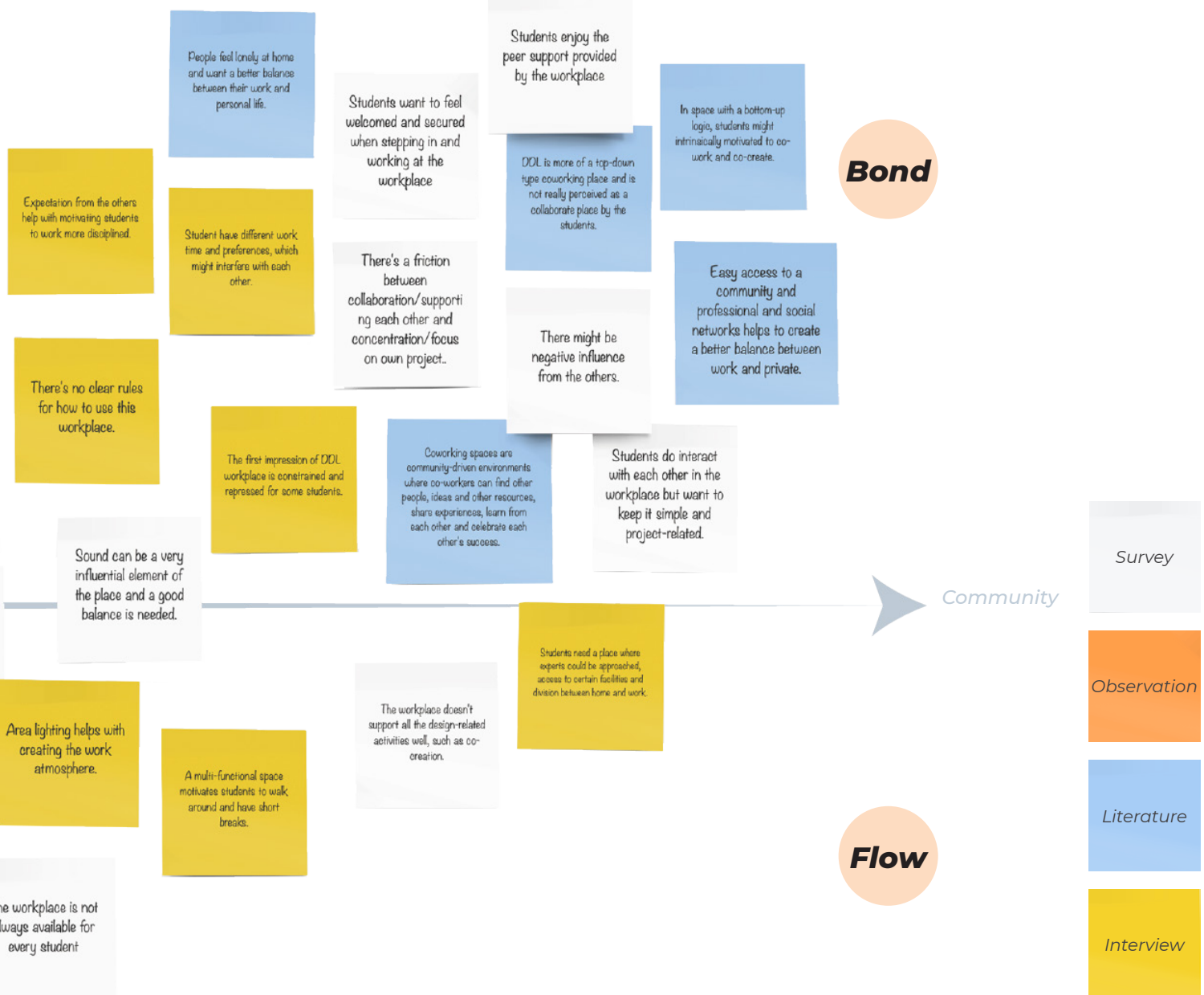
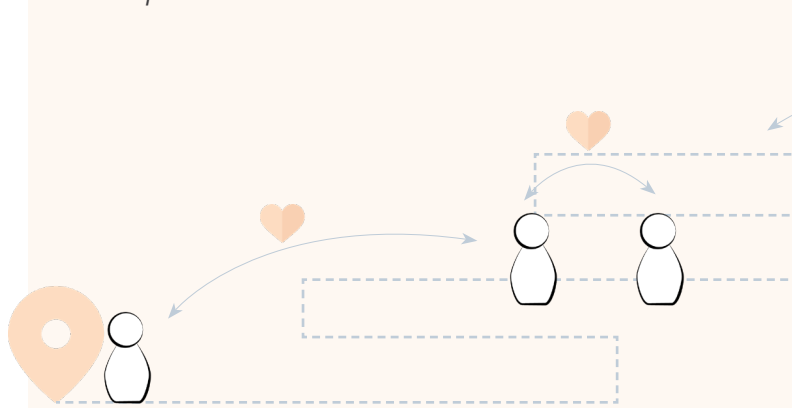


Figure 10. Cluster of research insights

After analyzing the matrix, I found that most of the insights were related to mental wellbeing of the students. Also, from literature research, the current DDL workplace is more of a top-down approach which makes the space rather cold to the students, less relatedness. To create a successful working space, one has to focus on creating a community (Rytkönen, 2014). Therefore, the design direction went to the “Bond” domain. I formulated my design vision as follow:

DDL workplace



Create

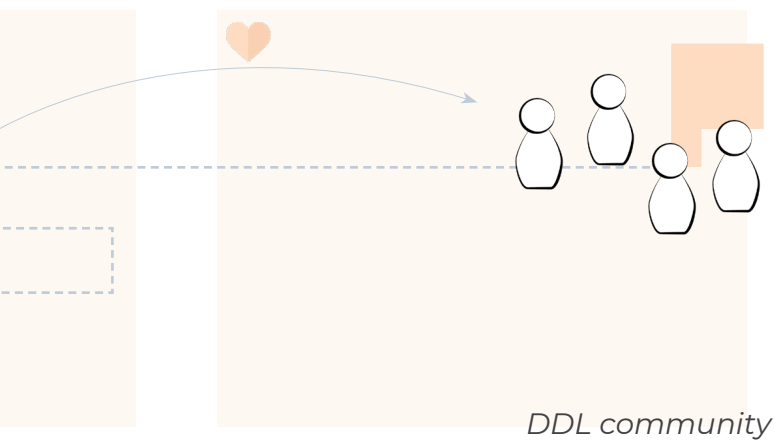
The DDL workplace should be a place which can help students from same or different labs start to know each other

“

*Make DDL workplace a
create and maintain bonds with
to mental connection with*

Mental connection

Although students are lumping together to work at the workplace, there weren't many meaningful interactions happening. The workplace provides a chance for them to meet and greet each other, and I aim to help them to develop a stronger association.



Maintain

The connection should be longlasting

a place where students can
th each other. And bond refers
others within a **community**.

”

Community

DDL unite scientists, students and societal partnersto catalyseknowledge development and design innovation. However students at DDL workplace didn't have a feeling of being in a community other than the peer pressure from others. I want to make the students part of something so that they feel both sense of belonging and responsibility to make the place a better one.



Emma

25 years old
IPD

She just started her graduation project for play well lab and has got the access to DDL workplace.

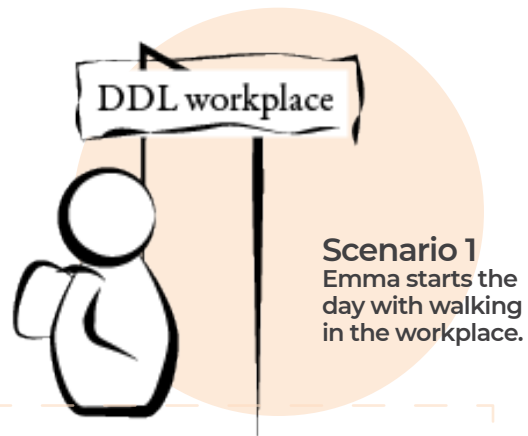
Storyboard

A storyboard was created based on the observation and interviews. The storyboard has four main scenarios/touch points which are: stepping in the workplace, working in the workplace, leaving the workplace and being away from the workplace.

After creating the storyboard, I aligned the insights with the storyboard. With a focus on the "Bond" domain, the key insights helped to understand the real context and address the problems of the current DDL workplace. With key learnings from the research phase, I create design goals to further explain my design vision.

Problems

Key Learnings



Students want to feel welcomed and secured when stepping in and working at the workplace.

Scenario 1
Emma starts the day with walking in the workplace.

Scenario 2
After finding a desk, she sets up the table and starts to work on her project.

There might be negative influence from the others.



Easy access to community, professional social network to create a balance between work and private life.

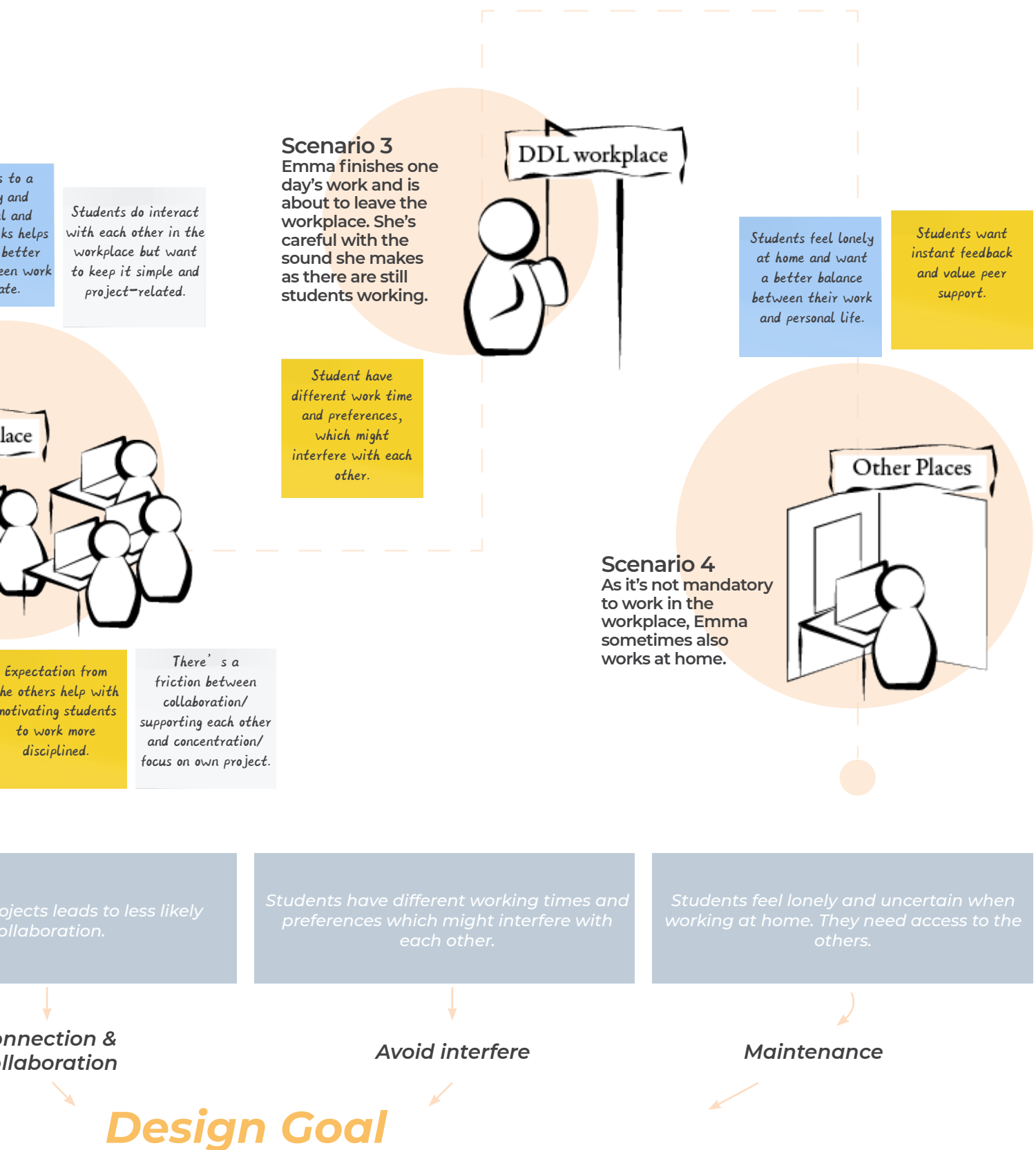
Users value working in a coworking space because of casual small talk, knowledge sharing and brainstorming with others.

Students feel uncertain when they walk into the workplace. If they couldn't find a table or not sure if others are willing to share one with them, they don't feel like using the workplace.

Individual project work

Communication with others, also the workplace

Co-working space



DESIGN GOALS

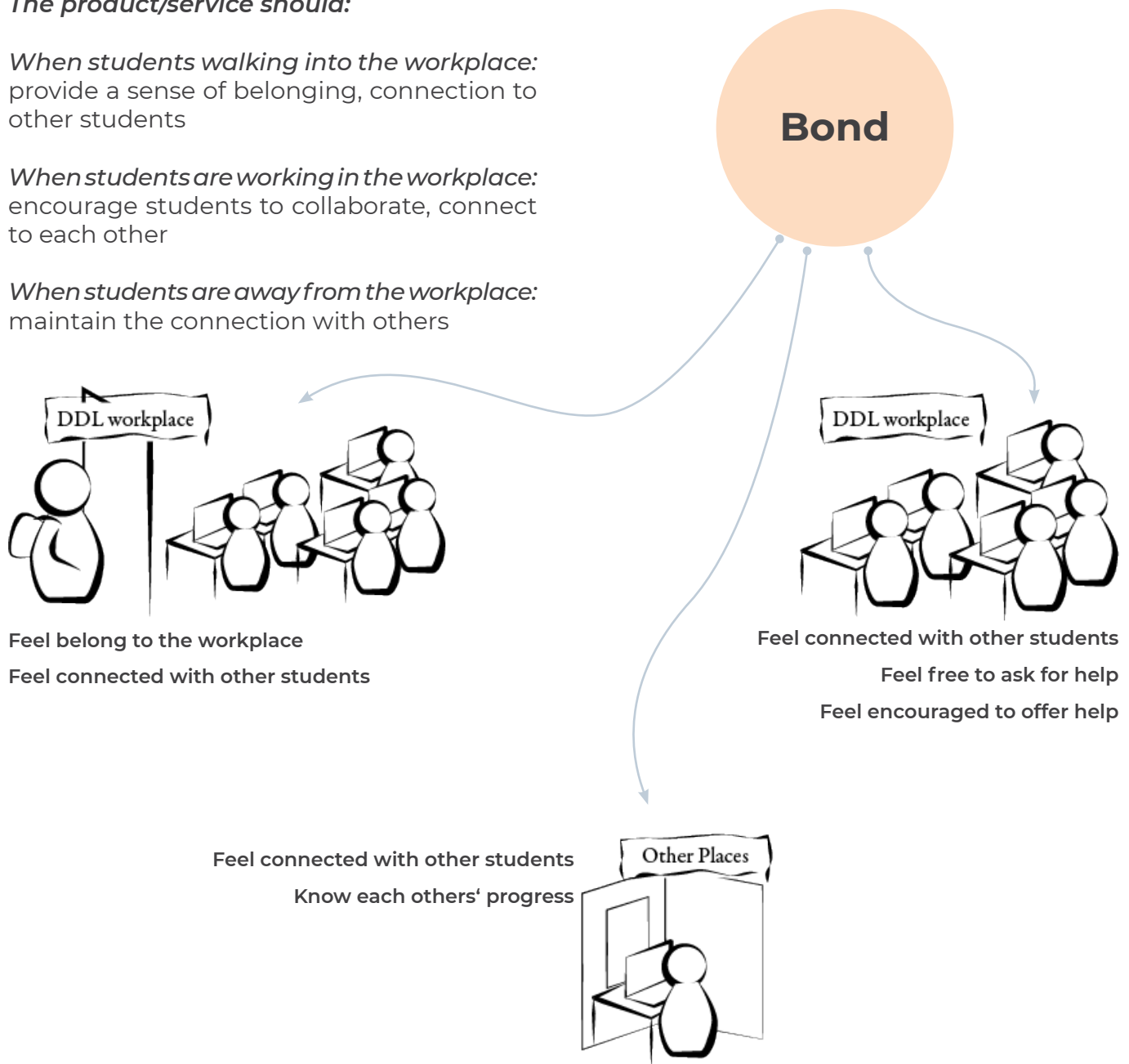
After formulating my design vision and defining the problems, I created design goals to lead my design phase. The design goals are as follows:

The product/service should:

When students walking into the workplace:
provide a sense of belonging, connection to other students

When students are working in the workplace:
encourage students to collaborate, connect to each other

When students are away from the workplace:
maintain the connection with others



CO-CREATION

After creating design goals for my project, I conducted a co-creation session with students who work on graduation projects for Delft Design Labs. The session aimed to generate more ideas with potentials to become a solution which can meet my design goals.

Due to the coronavirus, we conducted the session online by using Miro, an online whiteboard for collaboration.

After introducing my graduation project to the participants, I let them went through the insight cards to get a better understanding of the context. The insight cards could also be inspirations for them during brainstorming. After the brainstorming, we clustered the ideas into different groups and then named the groups.

Project introduction

insight cards(10 mins)

Diverge

Brainstorming(15-20 mins)

5 rounds, 3 mins per round, participants pass writing cards clockwise

Converge

Idea clustering(10 mins)

name the clusters afterwards

Idea selection

Each one put "like" on the favorite ideas and then explain a bit (10 mins)

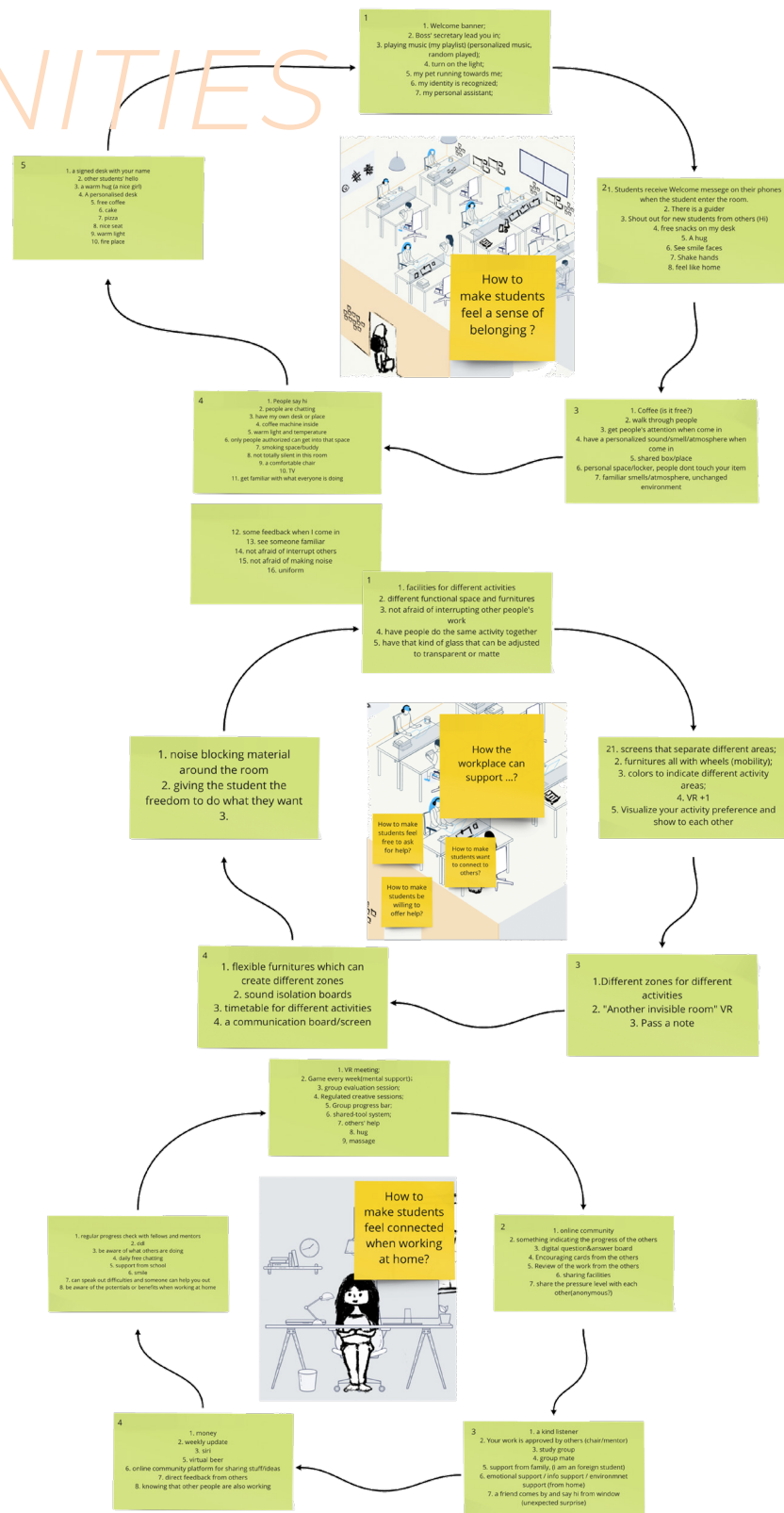


Figure 11. Brainstorming ideas

DESIGN OPPORTUNITIES

Ideation questions:

How to make people feel connected with each other at the workplace?

Social contact

Organised service

Physical environment



How to make people feel the sense of belonging?

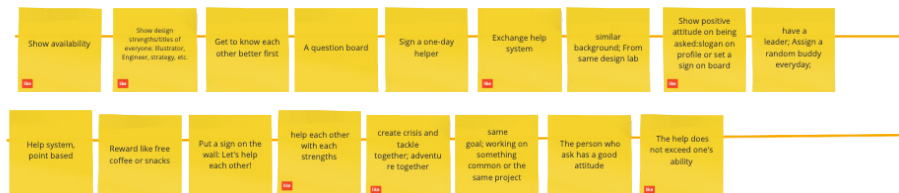
Environment

Behaviors



How to make people feel free to ask for help?

How to encourage people to offer help?



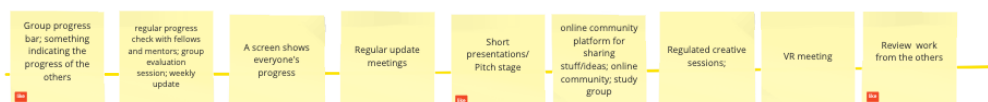
How to make people feel connected when working at other alternatives?

Mental support from the others

Access to others

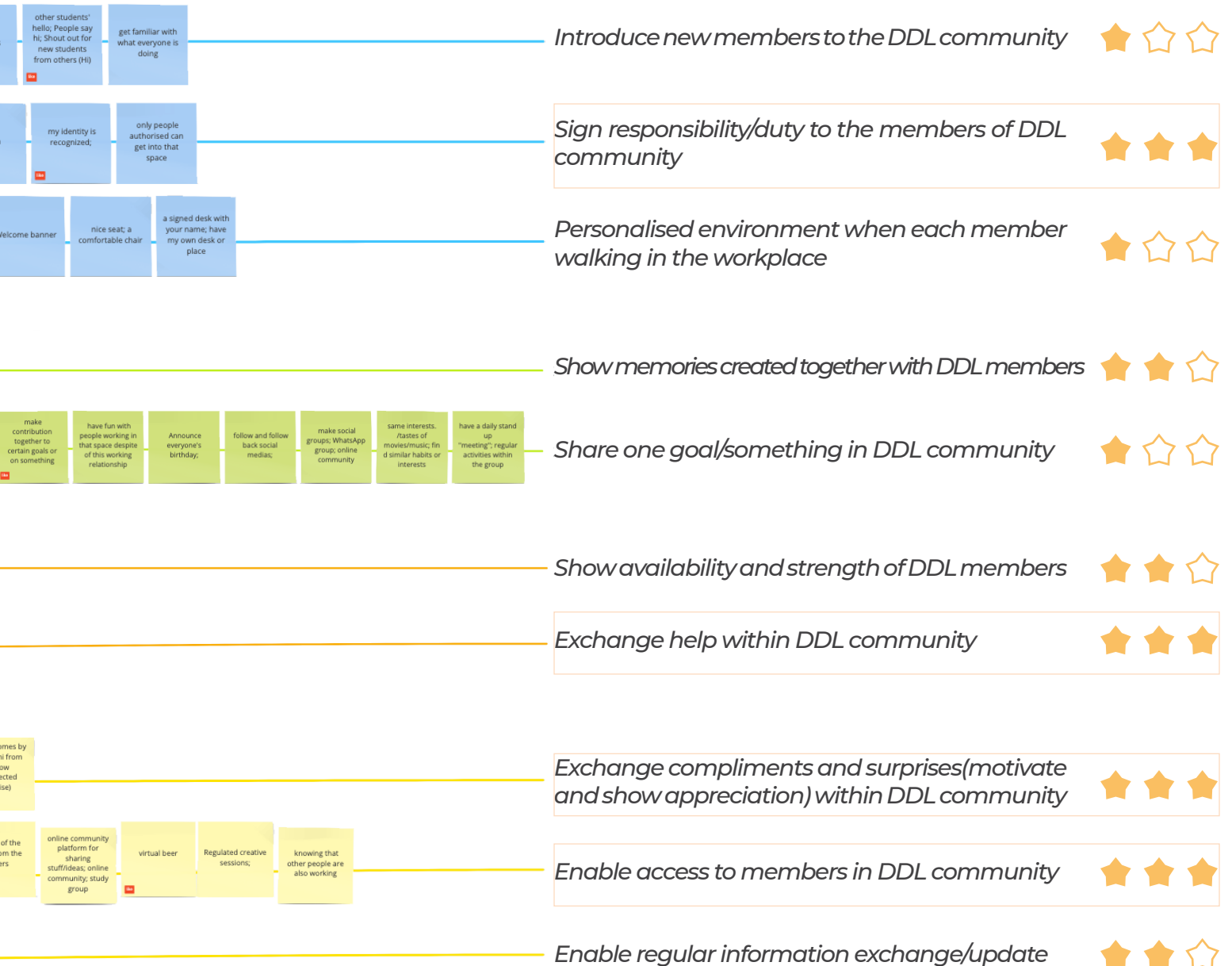


How to make people be aware of what the others' progress?



Design opportunities:

Score:
refer to bond



Design Opportunities

Chapter 5

- *Sign responsibility/duty to the members of DDL community*
- *Exchange help within DDL community*
- *Enable access to members in DDL community*
- *Exchange compliments and surprises(motivate and show appreciation) within DDL community*

● *Encourage students to contribute to DDL workplace*

● *Identity sharing inside DDL workplace*

● *Showing appreciation within DDL workplace*

➔ ***Brainstorm***

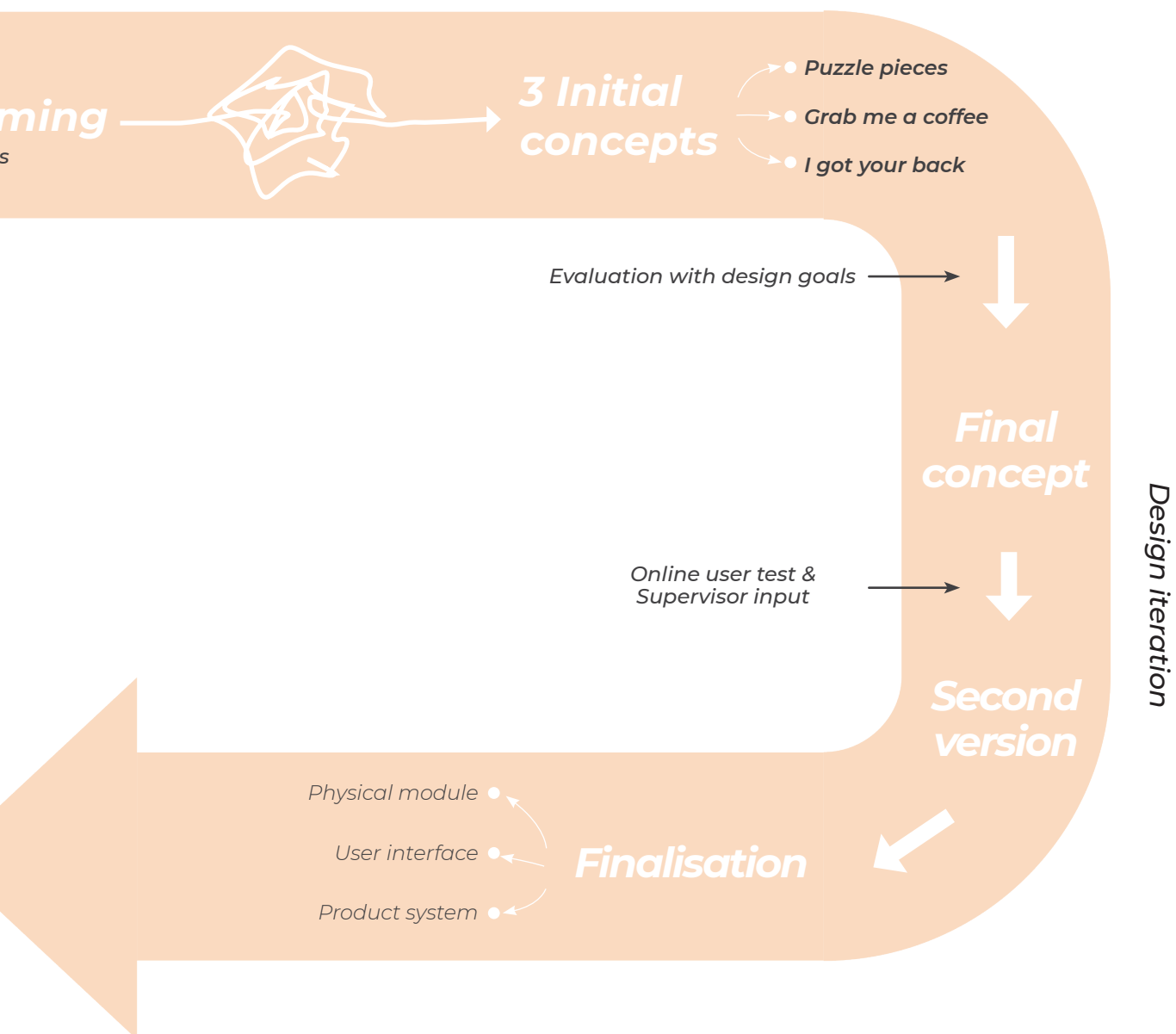
Analogies

Final Design

Chapter 7

6. CONCEPTUALISATION

DEVELOPMENT PROCESS



DESIGN CONCEPTS

With various creative ideas came out of the brainstorming and insights from previous chapters, three concepts from each design direction are proposed as initial concept directions.

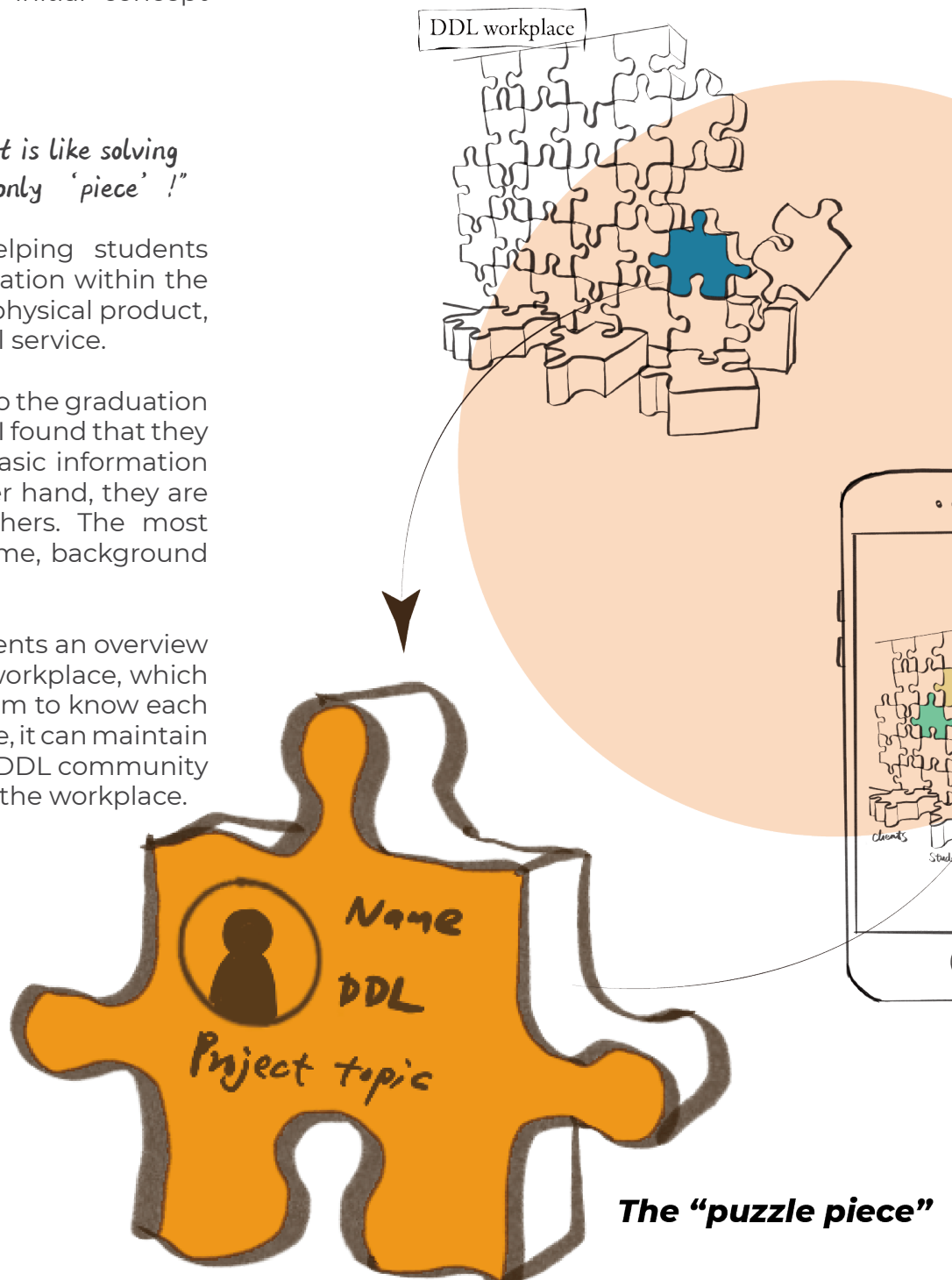
Concept 1: Puzzle piece

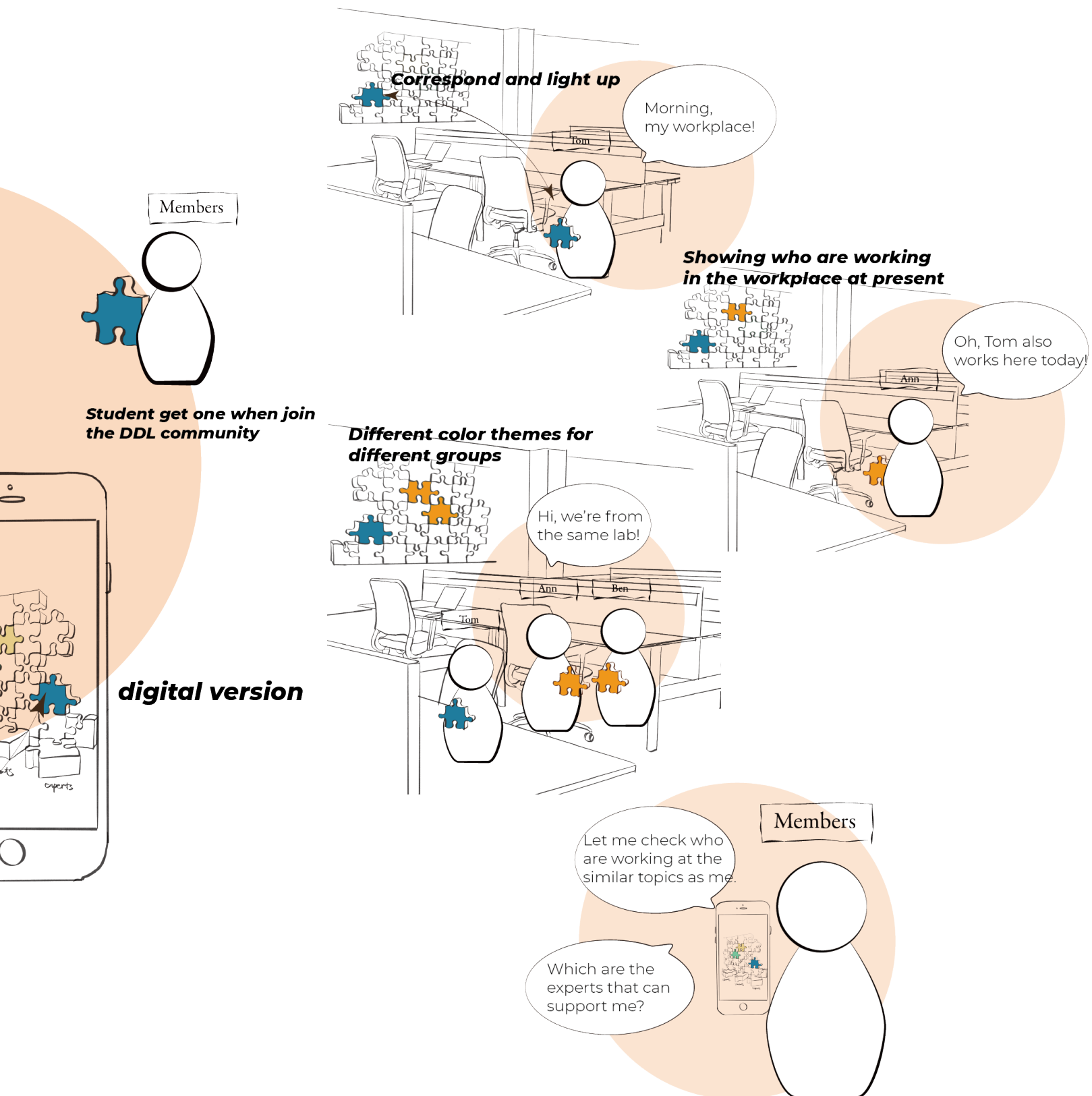
"Doing a graduation project is like solving puzzles, but you're not the only 'piece'!"

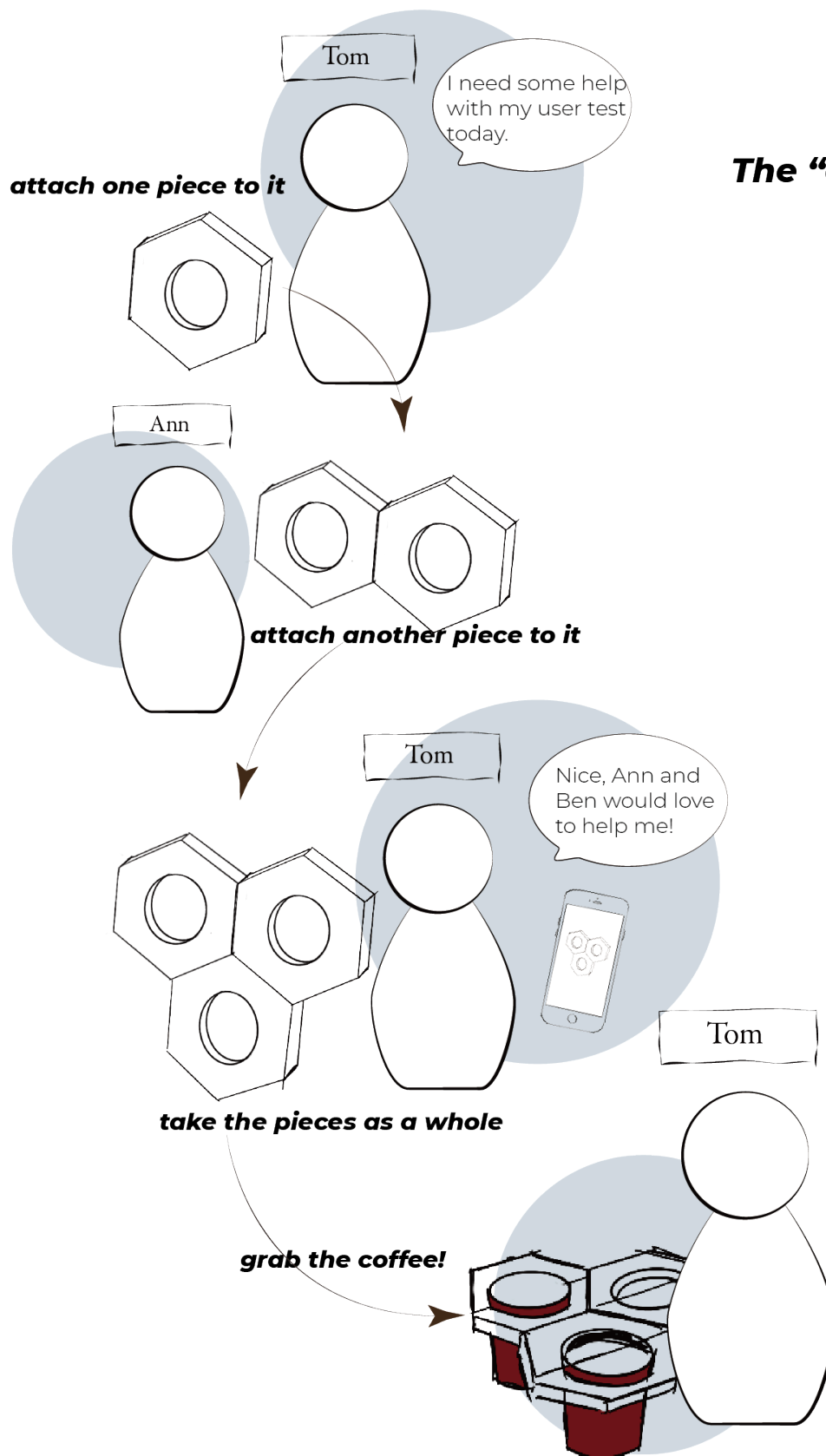
This concept aims for helping students sharing identity and information within the community. It consists of a physical product, the puzzle wall, and a digital service.

From a survey I distributed to the graduation students at DDL workplace, I found that they would like to share some basic information with the peers. On the other hand, they are also curious about the others. The most wanted information are name, background and project topic.

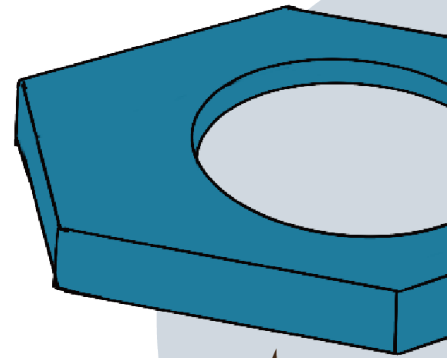
This concept gives the students an overview of who are working at the workplace, which could be a start point of them to know each other. With the digital service, it can maintain the connection among the DDL community even if the student is not at the workplace.



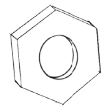




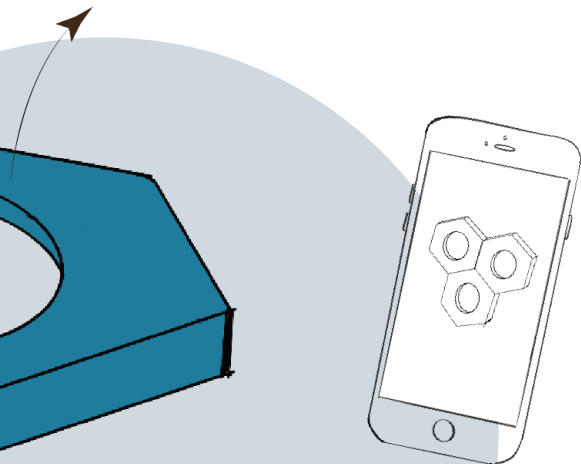
The “coffee holder”



GRAB me A COFFEE

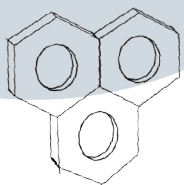


write information



Notification

COFFEE on me



Concept 2: Grab me a coffee

"Coffee is fuel to help designers with their long nights and early mornings."

This concept aims for encouraging students to help each other within the community. It consists of a physical product and digital service. The small modules can be attached onto the two areas, and also to each other. The digital service will notify the users who are connected to them.

I remembered when I was working in a design team, we usually start the day with bringing our teammates a cup of coffee. Coffee is like fuel for a designer and an icebreaker for a design team.

This concept provide a tool for the students to lower the boundary for asking or offering help.



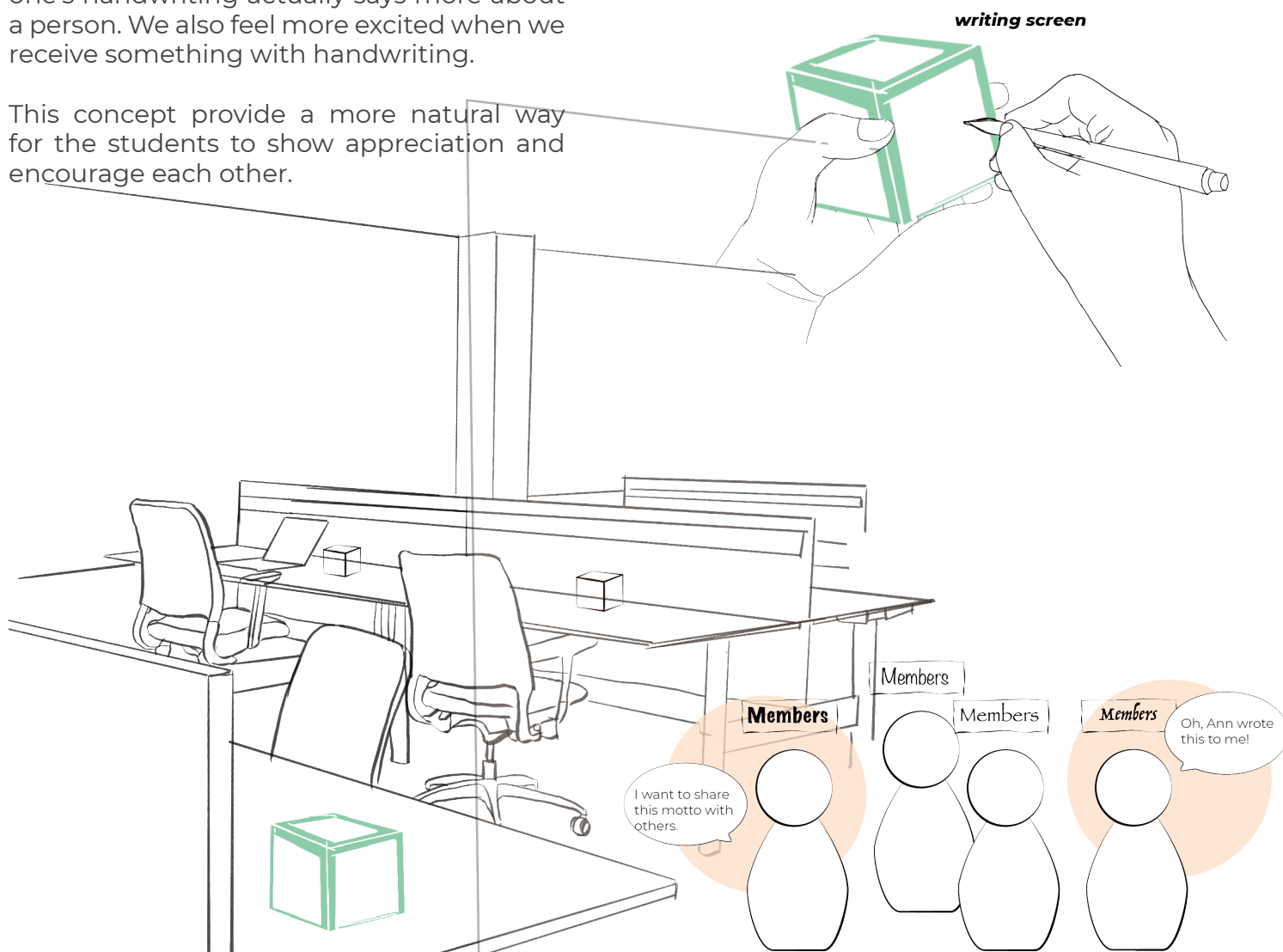
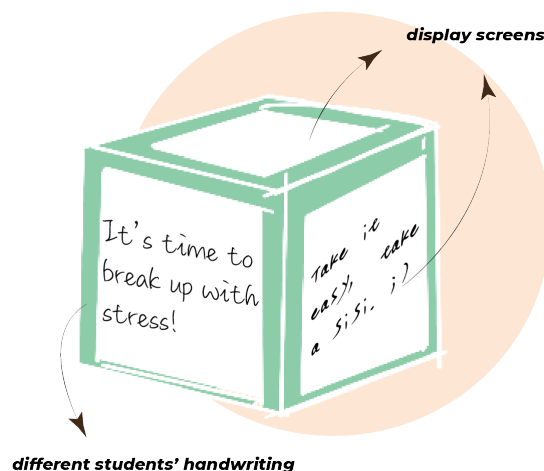
Concept 3: I got your back

"Handwriting is more connected to the movement of the heart."

This concept aims for creating a cheerful environment by means of enabling students to encourage and appreciate each other. It's a product with digital screens. Students can write on it, and the words will be shown on the other boxes with the same writing style.

Nowadays, we mainly communicate through digital devices, using similar kinds of fonts. We type to express our emotions. However, one's handwriting actually says more about a person. We also feel more excited when we receive something with handwriting.

This concept provides a more natural way for the students to show appreciation and encourage each other.



CONCEPT DECISION

Concept evaluation

To evaluate the three initial concepts and decide on which one to continue with, I first presented them to the supervisor team and two students from Living Office Lab, which are also potential users of DDL workplace. The meeting was conducted online, Miro was used for showing the concepts.

Feedbacks from the meeting can be summarized per concept:

Concept 1

- 😊 It creates an overall view of who are working at the workplace
- 😊 Especially good for new comers
- 😊 The app is a good extension
- 😞 There might be a better form than puzzle piece

Concept 2

- 😊 Coffee chat is a good ice breaker
- 😊 It encourages face to face interaction among students
- 😞 The area available for writing is too small

Concept 3

- 😊 The handwriting element is interesting and meaningful
- 😞 There might be no further interaction
- 😞 Sometimes handwriting is not that readable

After the discussion, I found that all three concepts contributes to creating bonds among students working at DDL workplace. Each concept has its pros and cons. Based on my design vision, I scored the three concepts from three aspects to quantify the three options to make a decision:

1. How much does it help to create the bond?
2. How much does it help to maintain the bond?

3. How much does it help to create a DDL community?

The result is presented in figure 12.

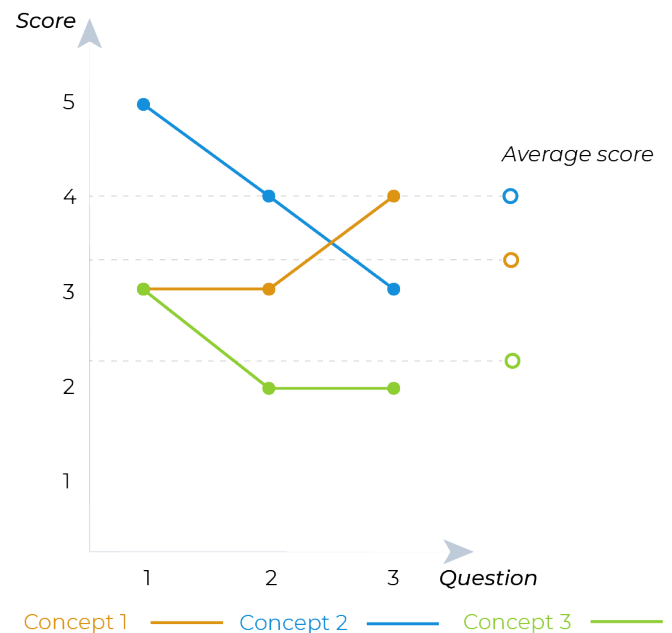


Figure 12. Quantitative evaluation result

Conclusion

Based on the discussion and the quantitative evaluation result, concept 2 performed better. However, concept 1 performed the best on creating a DDL community, which can makeup for the shortcomings for concept 2. Therefore I decided to combine concept 1 and concept 2 to a final concept.

FINAL CONCEPT

The final concept is a product-service system, “Hexabond”. “Hexebond” comes from “hexagon” and “bond”. It means “connect from all directions”, which meets my design vision to create connections among students at the workplace. The product part consists of a physical module and a display wall; The service part consists of a digital app:

Physical module

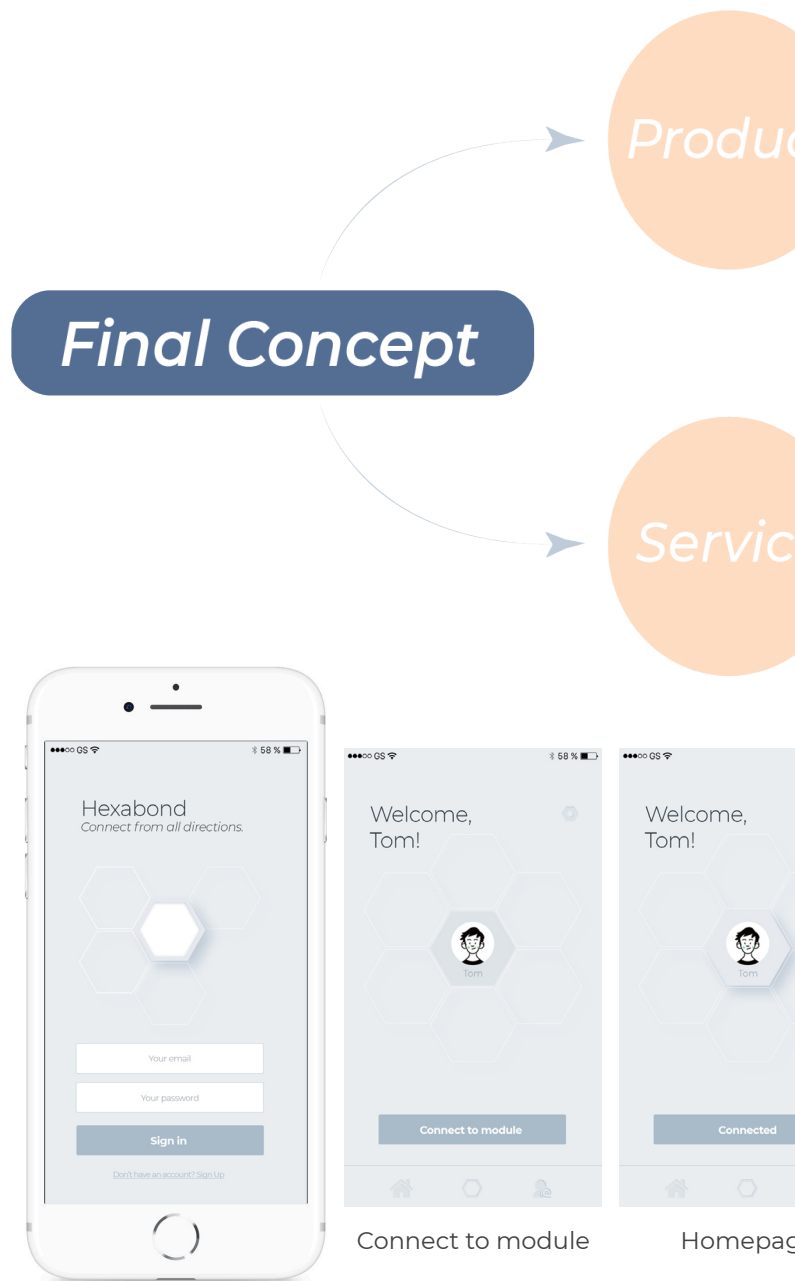
a physical module, which can be used as coffee holder. On the other side, there is a whiteboard where students can write and personalize on the module. The pieces can be attached to each other and also to the displayboard through magnetic connection.

Display wall

The display wall is a magnetic board which has three areas. “Coffee on me” means the student would like to offer coffee for some help or discussion. “Grab me a coffee” means the student is open to help or discussion. “I’m good” means the student prefer to work on their own. It gives students who work at the workplace an overall view of who is working at the moment.

Digital app

Every student can claim one physical module through NFC connection. After claiming one module, they can just go to their working spot to work and the app will indicate when someone connects to him/her. At the same time, they both can check some basic information of the other side from the app. When he/she is leaving the workplace, the connection can be terminated through the app.



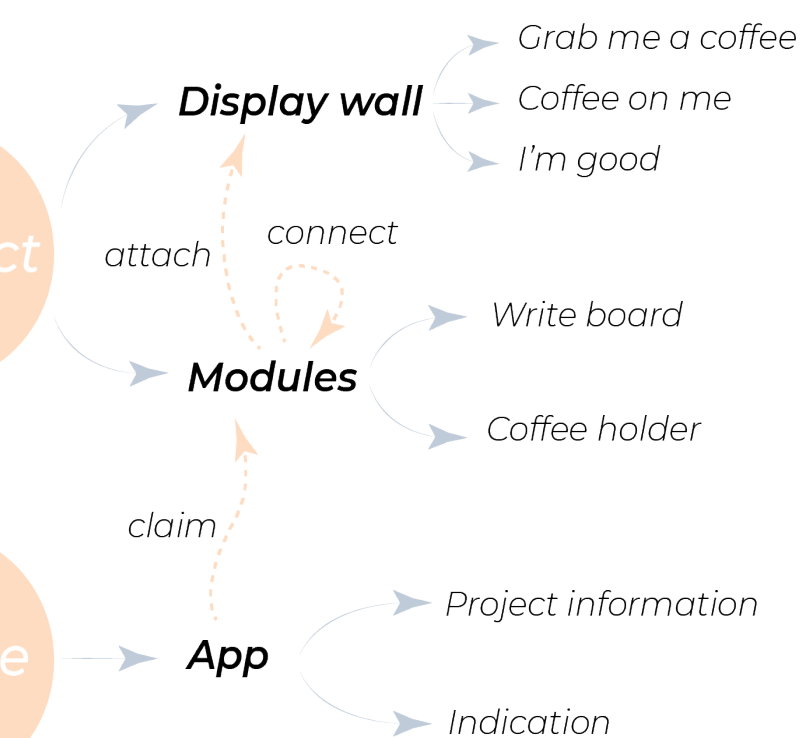


Figure 13. Physical product of the final concept

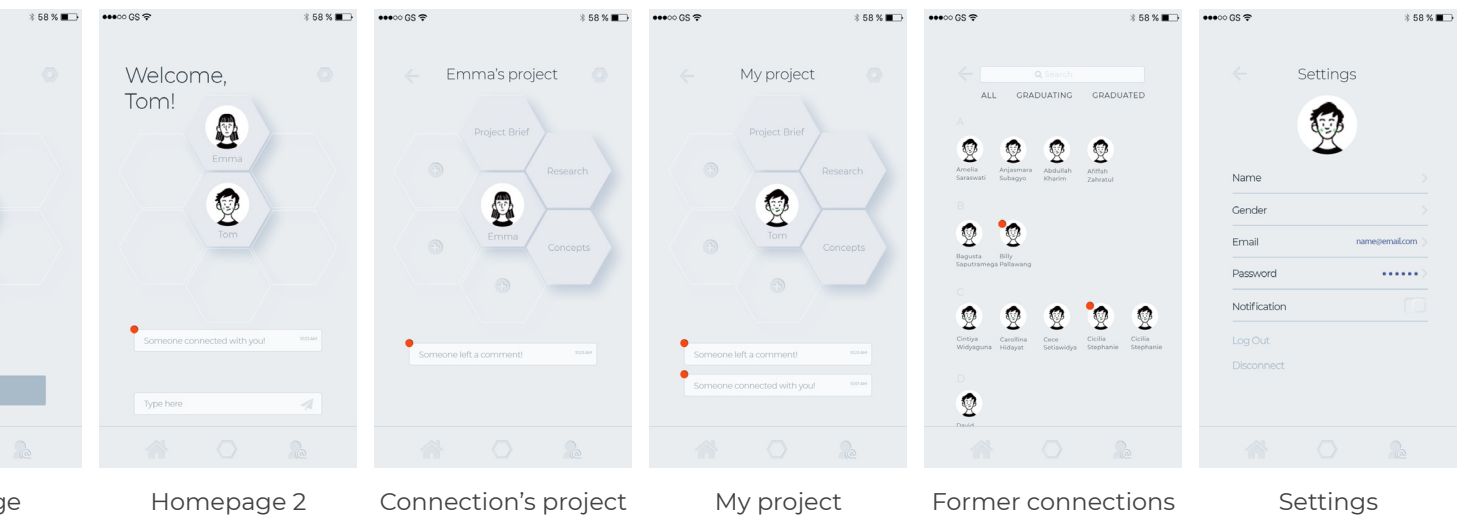
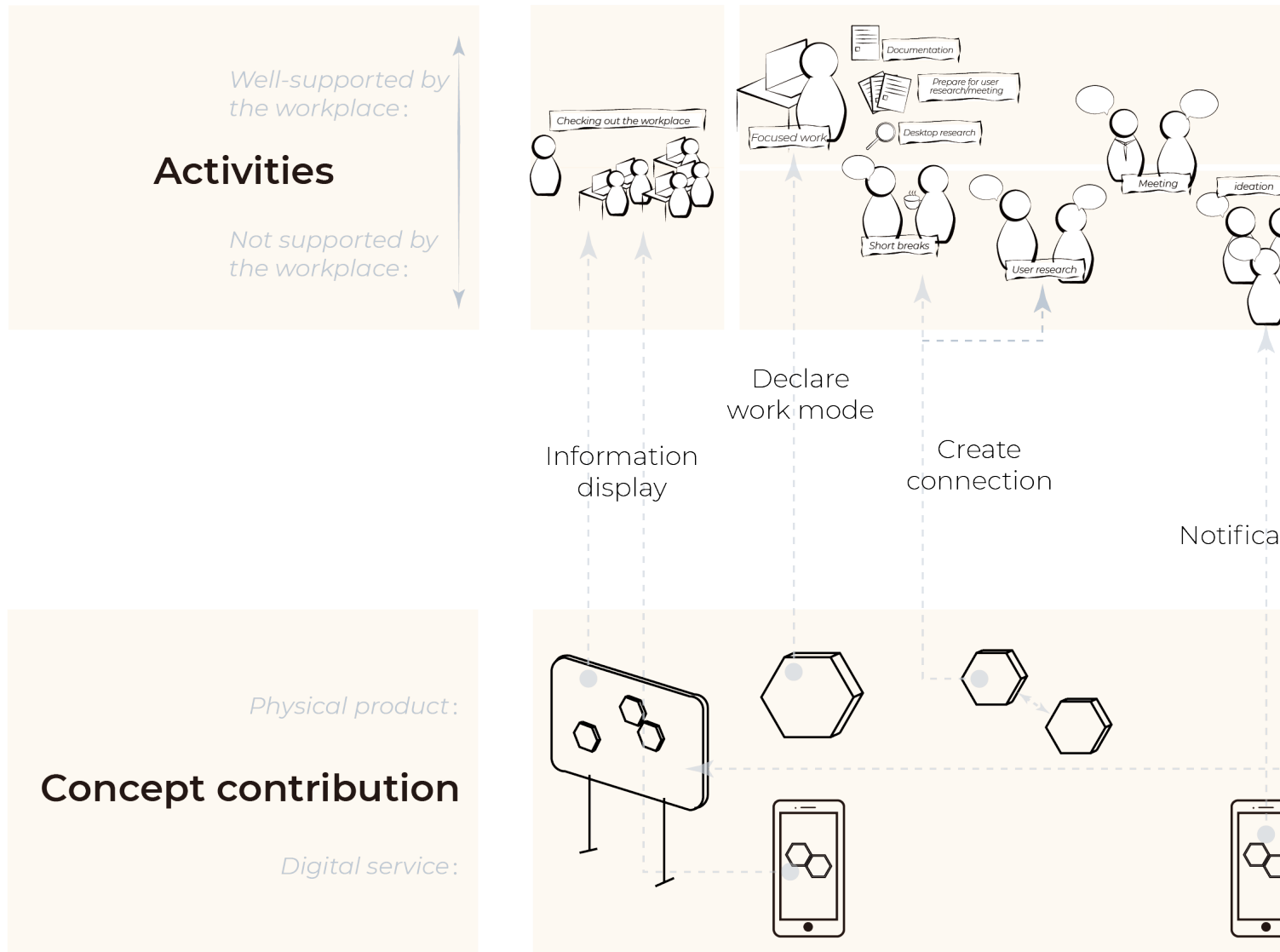


Figure 14. Digital interfaces of the final concept

User scenario

To better illustrate the product system, I listed the main functions of the product system and how they

- Startpoint of a project
- Midterm
- Greenlight
- Current project period



contribute to different activities of the workplace.

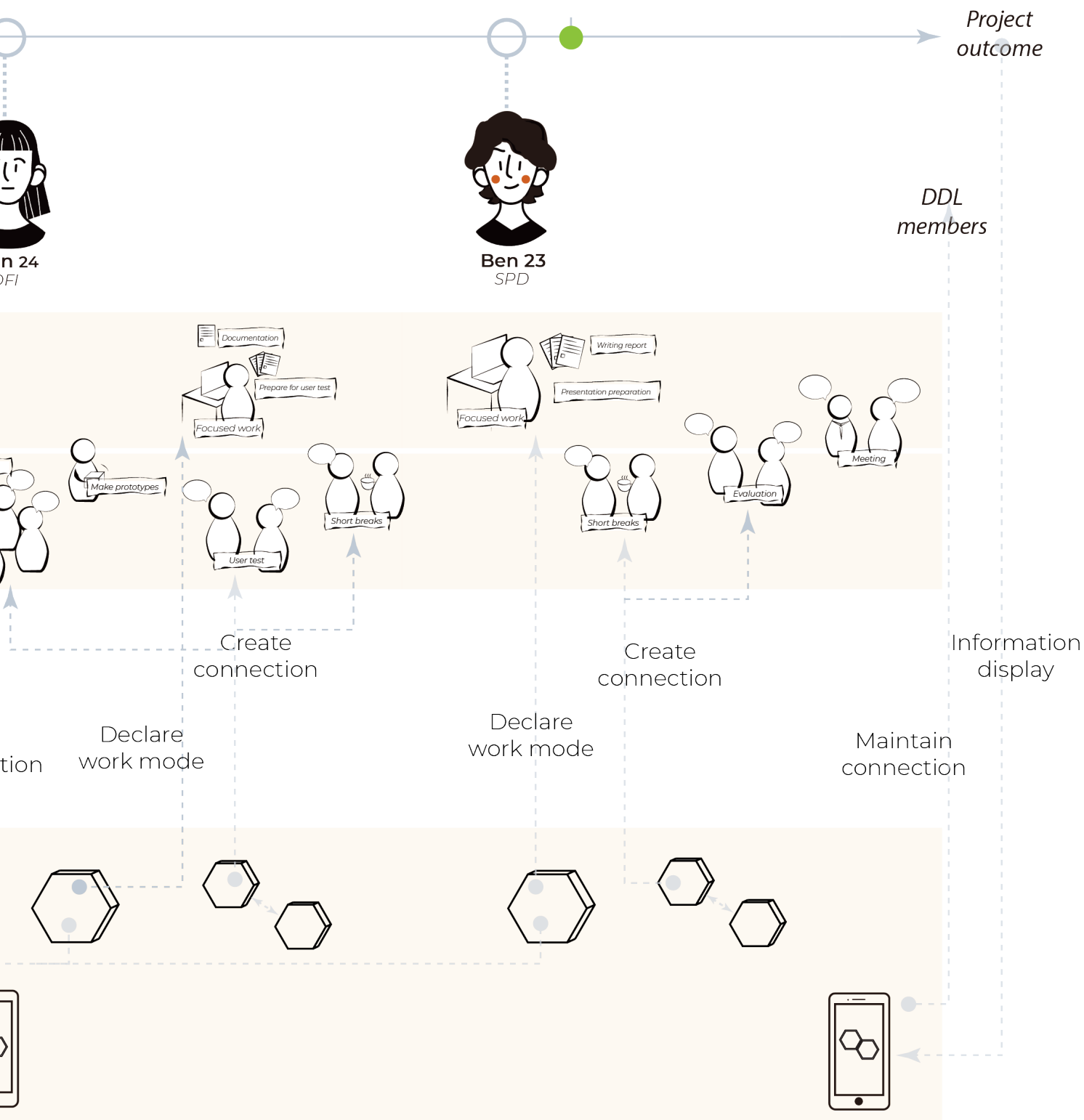


Figure 15. Product system map(function based)

DESIGN ITERATIONS

User test

To evaluate how well the final concept meet my design goals and how to further develop/iterate on the design, I conducted a user test with 5 participants. Due to the Covid-19 situation, I couldn't invite participants to test at the workplace. Therefore I shifted the user test online.

Test set-up

A quick prototype was made for the physical module to enable to interact with. A whiteboard was used for the modules to attach to. A phone was used to show the app interfaces. I filmed a two and half minute video at a shared workplace to show different user scenarios for the participants. An online questionnaire was made through Google forms, which included 6 quantitative questions and 3 qualitative questions.

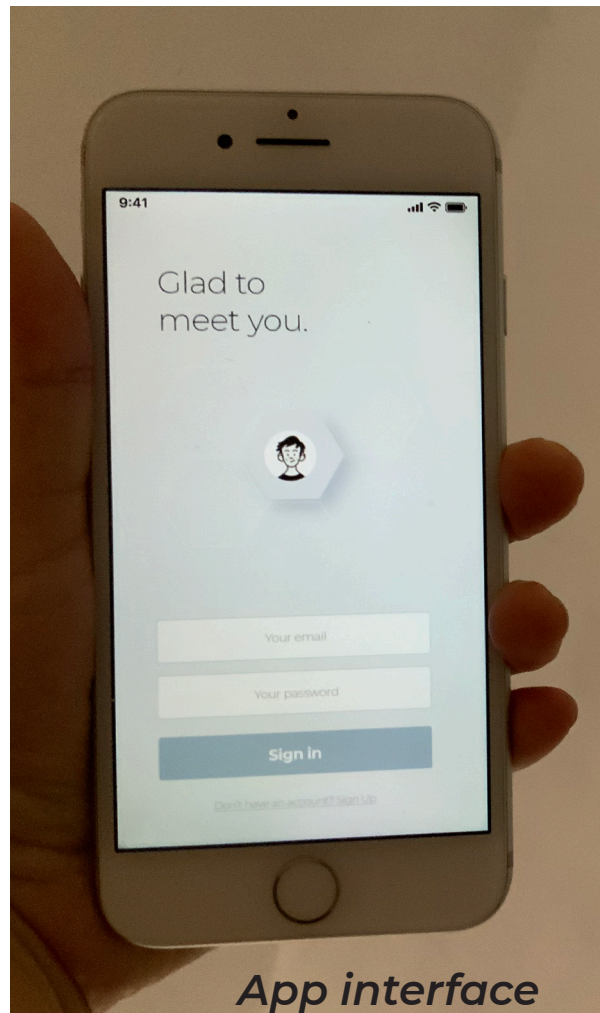
Participants

After discussion with the supervisor team, we saw a great potential to implement the design not only at DDL workplace but also other shared workplace for students. Therefore, I scaled up my user group to all graduation students. The participants were not limited to students who work on DDL graduation projects but also for companies. (3 participants work for DDL graduation projects, 2 participants work for company graduation projects.)

Procedure

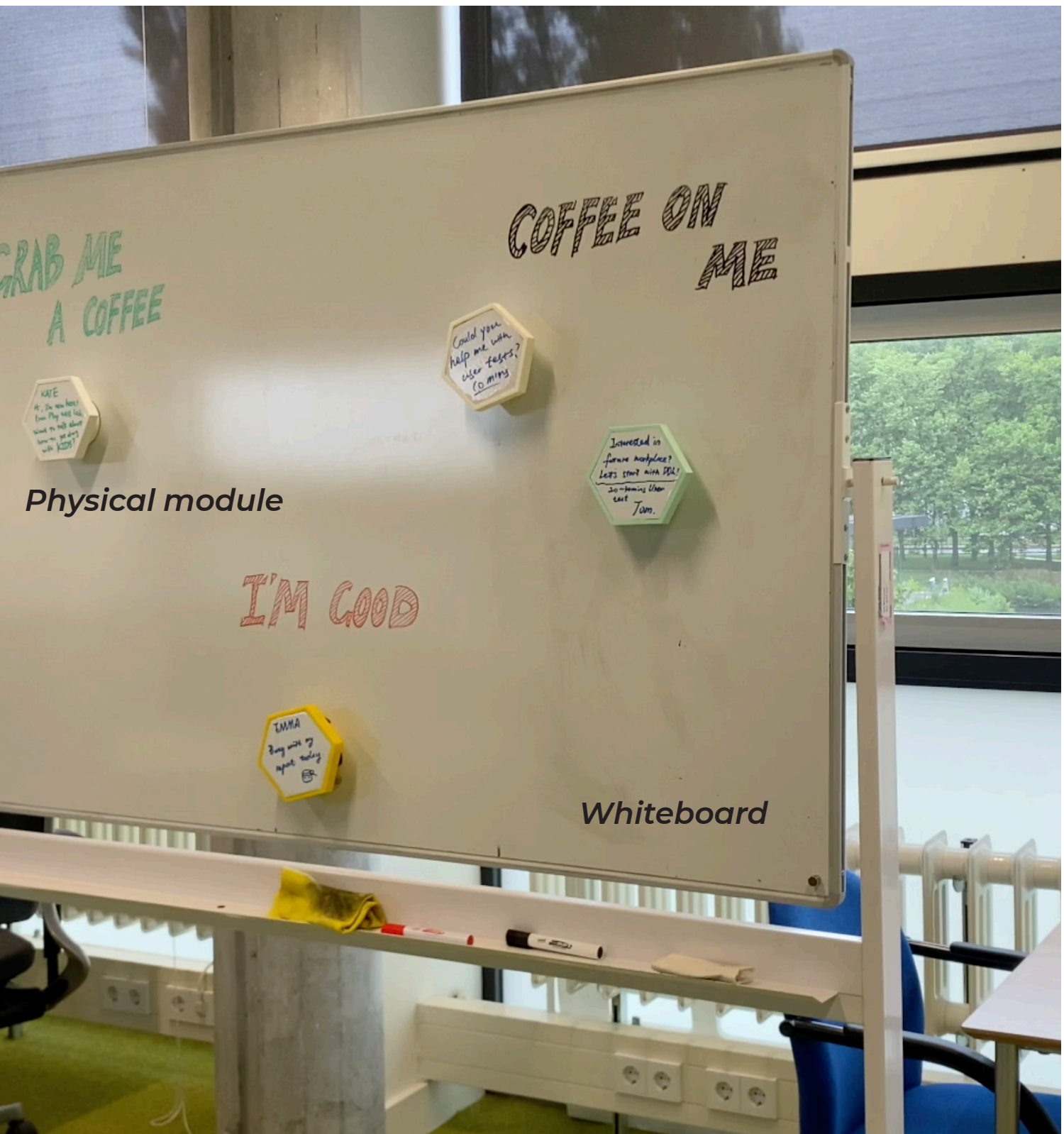
Before the test, I gave a short introduction of the final concept to the participants. The intro gave the participants an overall view of the product system. Then I asked the participants to watch the video. The main scenarios can be found in Appendix E.

After watching the video, participants were asked to fill in an online questionnaire with 6 quantitative evaluation questions.



App interface





Physical module

Whiteboard

Figure 16. Video shooting set up

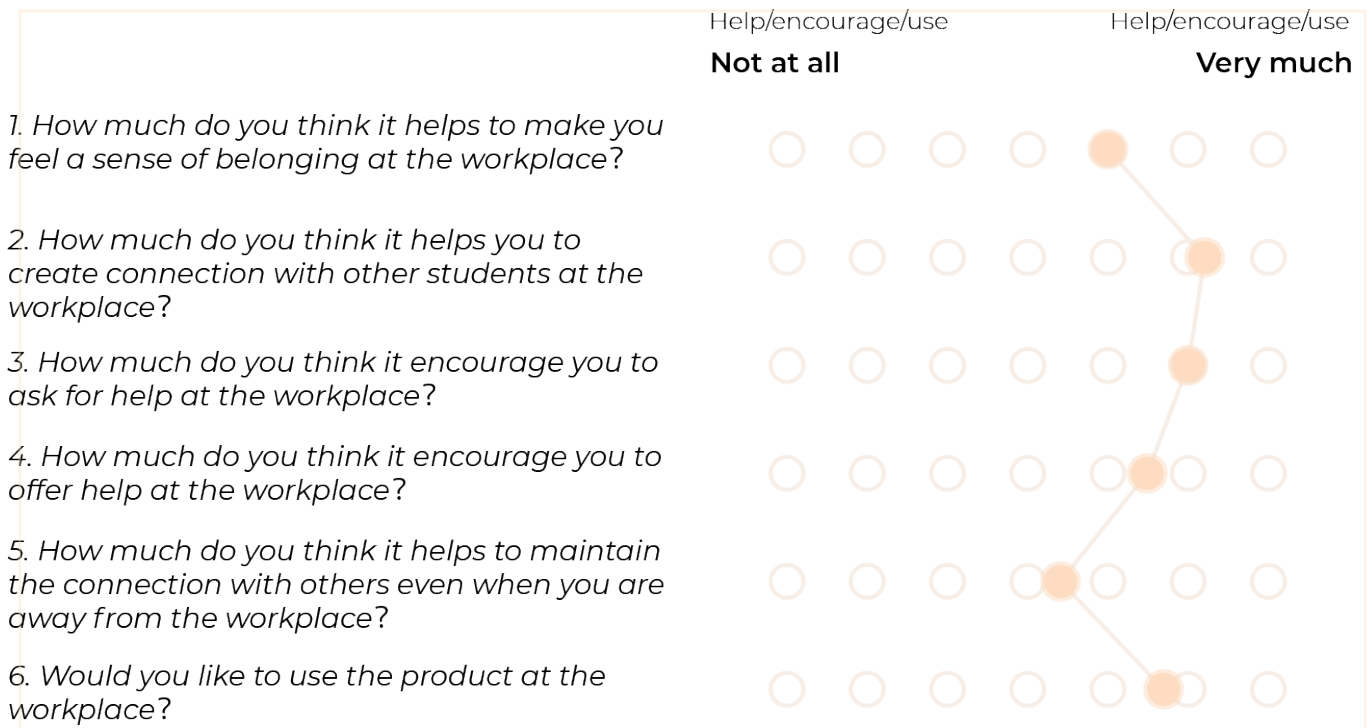


Table 2. Quantitative evaluation result

After filling in the questionnaire, a follow-up online interview was done. The online interview has three open questions.

Results

Quantitative results

Participants were required to fill in a quantitative evaluation form after the test. Results are presented in Table 2 above.

The average scores on the table shows that the concept meet my design goals quite well. However there is still space to improve, especially for maintaining the connection when students are away from the workplace.

Qualitative results

The three interview questions are open questions for participants to answer, these questions are:

7. Could you elaborate on the last question(Would you like to use the product at the workplace?)?

8. What do you like the best about the product?

9. What do you think that could be improved?

According to my own experience of using and participants' feedback, in terms of the physical module, there are following problems:

First of all, the appearance of the device needs to be improved. Two participants mentioned that the physical module looks too thick and it will take over too much space when using more than three pieces.

"Now the product is too thick and it needs to occupy a whole white board!" (Ryan)

"Maybe the thickness of the product, it looks a bit clunky." (Yix)

Secondly, the magnetic connection was not strong enough. The current magnetic connection couldn't hold the weight of two full cups of coffee. It was due to insufficient magnet attraction strength and the 3D printing material surface is too smooth.

According to the participants' feedback, in terms of user experience, there are following feedbacks:

The handwritten information was considered more meaningful than digital message.

"Still, it is a nice starting point to get to know each other by leaving real handwritten comments/drawings (I think it is better than a fully digital platform)." (Yin)

"I prefer to have it with physical interactive elements, it brings more meaning (feel like writing letters when leaving a message on the piece) compared with leaving comments on a digital platform and waiting for replies." (Ryan)

"I like the analog part, because we already look too much at screens. Writing things yourself makes it more personal." (Yix)

The design provided a start point for students, especially newcomers to get to know each other.

"I think it's really helpful when I come to a new workplace and barely know people there. That's a great tool for me to get involved with others." (Xiaochen)

"I think the concept would be popular in a sharing workplace where people don't know each other." (Yufei)

Users have doubts about how to use the product and understanding the meaning of the three areas of the display wall.

"I don't know what to do with it if I didn't see you writing on it." (Yix)

"The metaphor is interesting, but only after you explain it I can get the meaning." (Ryan)

"I don't understand why I have to grab you a coffee or why you want to give me a coffee, especially when I first walk into a workplace." (Ryan)

The collaboration is limited within the users in the workplace while some students also work at different places

"I hope the APP could include more service for collaborating when we are not at that workplace." (Xiaochen)

"Sometimes I can't get a spot at the workplace, I hope the information can also be updated online for those people who didn't see it or didn't come to the place." (Yufei)

Conclusion

Based on the user test result, the design meets my design goal quite well in terms of helping with creating connections and encouraging students to help each other. On the other hand, it also has space for improvements on both the physical product and the service.

- Physical product: the appearance of the physical module should be lighter and smarter. The magnetic connection needs to be more stable and safe;

- User experience: for initiating the product, inspirations on how to use the physical module and explanation of the display wall are needed;

After discussing with the supervisor team, due to the limited time frame, I decided to focus on improving the overall user experience. Therefore, the detailed appearance design of the product and technical issues will not be considered in-depth.

Therefore, the design should be further optimised and the redesign targets are:

- Guidance for first time users to explain the display wall and inspirations for how to use the physical module;

- The digital service should be an extension of the physical workplace and help to maintain the connection;

7. FINAL DESIGN

OVERVIEW OF THE FINAL DESIGN



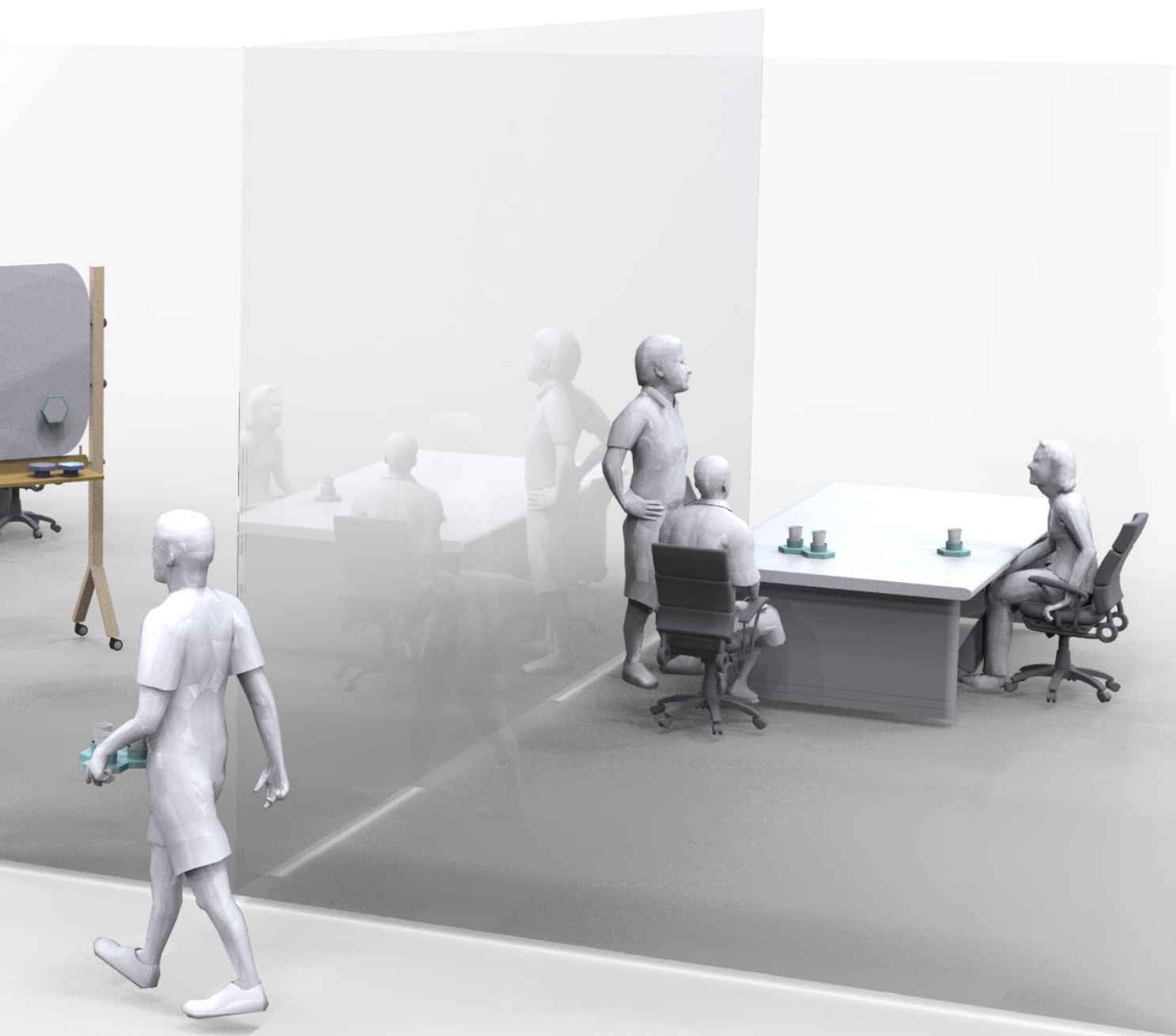


Figure 17. Rendering of the final design in context

USER JOURNEY

Before/When working at the workplace

1. Logging in

Students can log in Hexabond app through email address or TU Delft student account.

2. Claiming one physical module

When entering the workplace, student can claim one physical module. By simply bring the phone close to the module, the app will automatically start. After clicking “connect to module” button, your account can be linked to the module, which means you have claimed one module.

3. Personalizing the physical module

Students have freedom to personalize their modules based on their mood and project progress. They can use marker to either write or draw on the module. The information can also be changed through out the day.

If it was a first-time user, there will be some walkthrough interfaces to show some examples of what to put on the module.

4. Attaching the physical module to the display wall

After putting information on the module, students can attach the modules to different areas of the display wall.

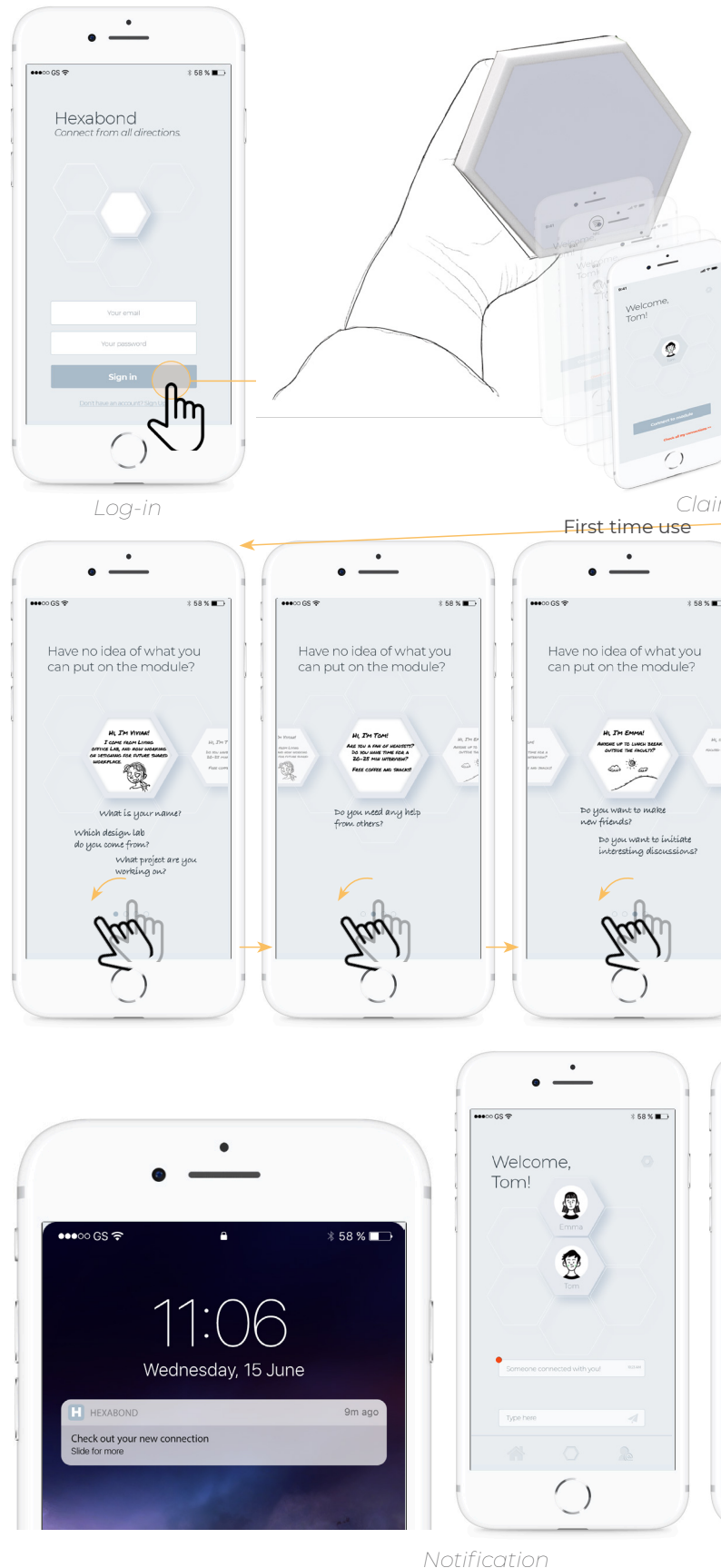
6. Working

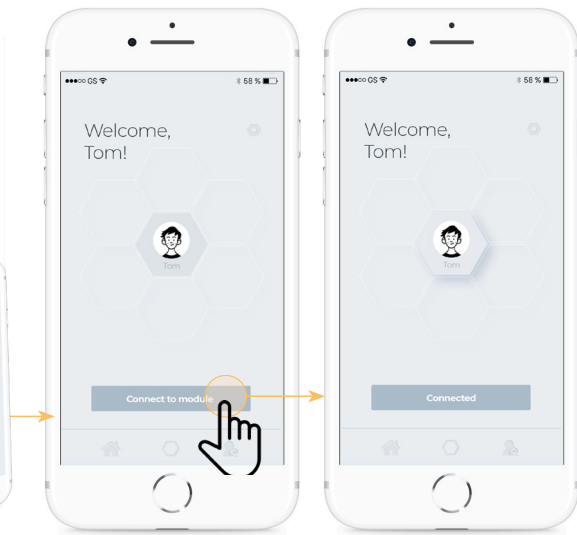
Students can work at the workplace based on their own planning.

5. Checking notification on the phone

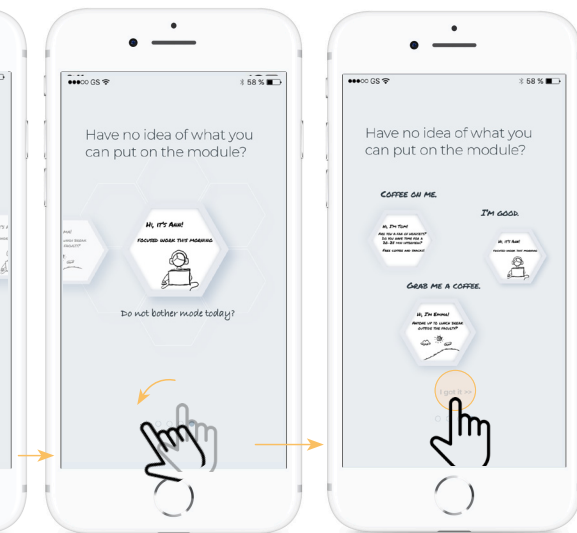
When someone connect another module with yours, there will be notification from the app. You can also check at the homepage of the app.

The names and profiles of the ones who joined can also be checked on the homepage, which gets students prepared for the face-to-face interaction.

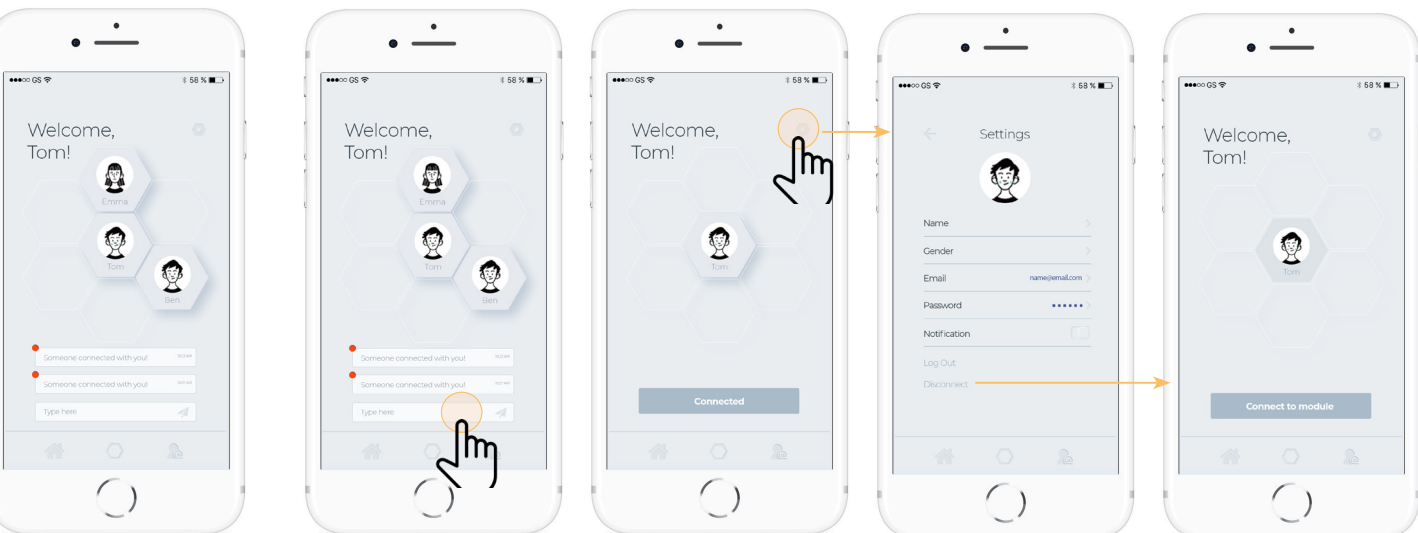




Connect to module



Walkthrough



Inform

Unclaim

6. Informing the group

The initiator can inform the ones who would like to join when he/she will grab the coffee (start the activity). He/she can do it either through the app or ask face to face, according to the working atmosphere at the time.

7. Getting the coffee(the initiator)

The initiator can take the modules from the display wall as a coffee holder. The size of the coffee holder will vary based on the number of students who joined in. It's very convenient for getting more than two cups of coffee in one time.

8. Face-to-face interaction

After getting the coffee, the group can start a face-to-face interaction such as a user test, a casual chat, or a co-creation session in a separate room of the workplace.

9. Unclaiming

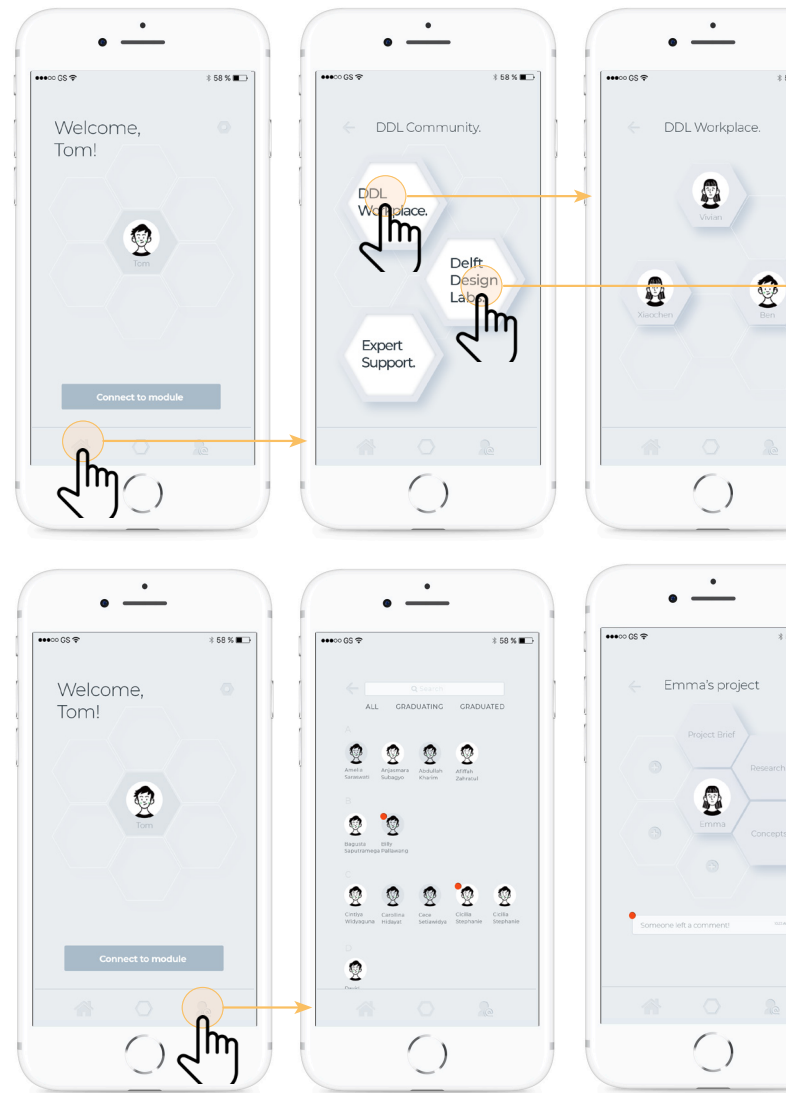
When students are finishing the project and leaving the workplace, or do not want to use the physical module anymore, they can disconnect in the setting interface.

When being away from the workplace

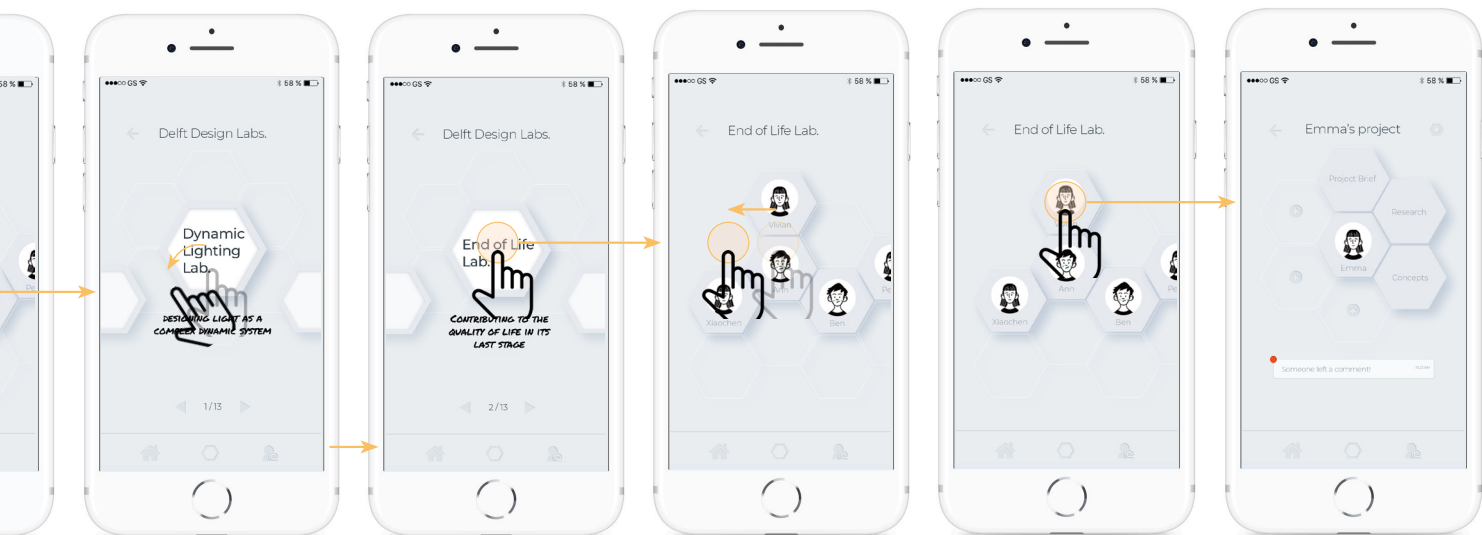
10. Checking the community and my connections

Even when the students are not at the workplace, they can still check information of DDL community, such as students working in the workplace, former graduation projects of Delft Design Labs, members of different design labs, etc.

Students can also check their former connections on the app, feeling supported by fellow members of DDL community. It also helps to maintain the connection between students who helped each other out.



Checking my connections



Checking Delft Design Labs and members

tions

TECHNICAL REALIZATION

Physical module

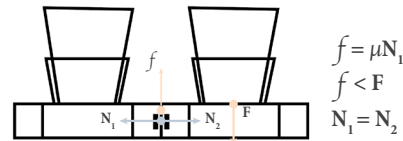
Magnetic Connection

The physical modules will be connected to each other by magnets. The magnets are hidden inside, for aesthetic purposes. Magnets are strongest when they make direct contact with the other magnet or ferromagnetic materials such as iron, nickel and cobalt. Considering cost and safety, iron should be the best as contact material.

In order to make the connection strong enough to hold another module and a cup of coffee, strong magnets are needed. With a rough calculation, the magnets need to be able to provide more than 4 N per side. Due to the direction of the gravity, only half of the magnets strength is utilized. So the magnet needs to provide 8 N or even more due to the distance between the magnets.

Leverage Prevention

The centre of mass of the physical module is quite far from the magnet. This results in a moment arm which will leverage the magnetic connection and makes the module fall off when the weight is too high.



To prevent this, stronger magnets are needed, but the size will also increase. A solution for this would be using small pins that prevents leverage. The cylindrical protrusions and holes are there to prevent the breaking of the connection when carrying coffee.

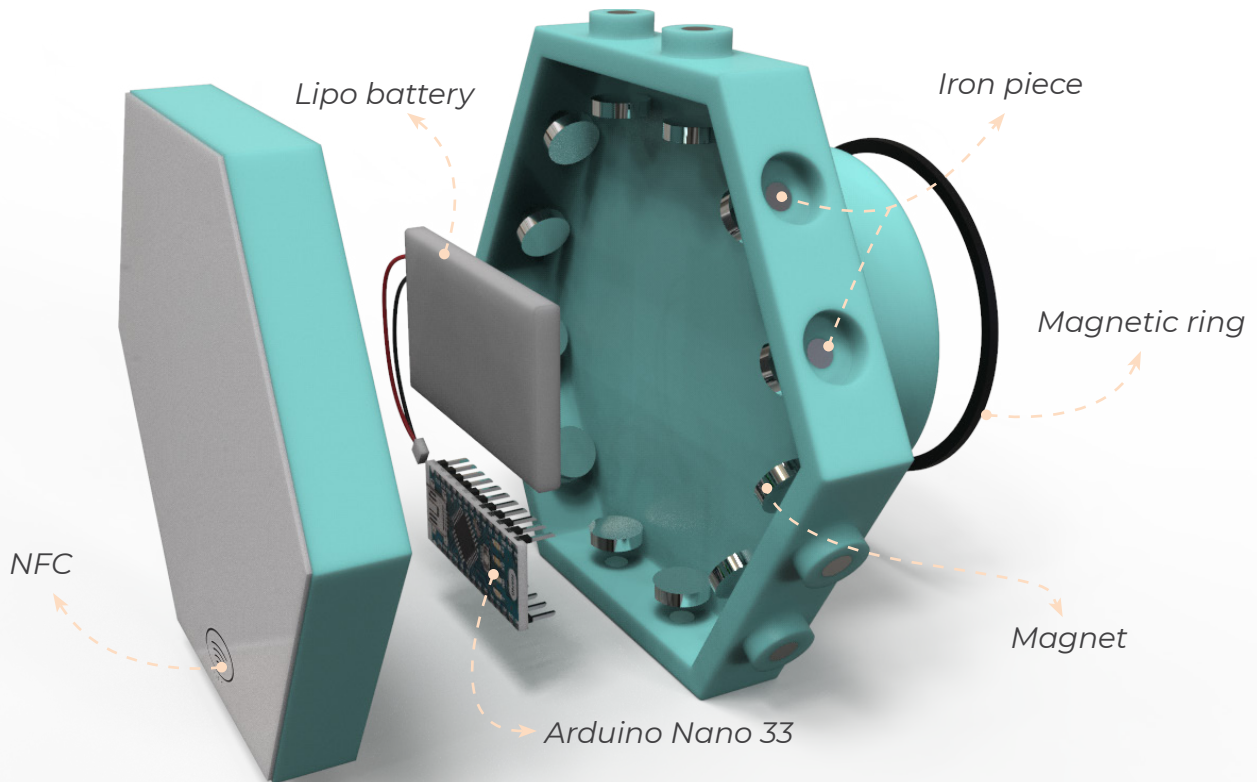


Figure 18. Exploded view of the physical module

Digital service

Claiming a physical module

Every physical module has an unique identification number, which will be linked to the user's smartphone. By doing so, the user can link their digital profile on Hexabond app to the physical module. The physical module will have NFC tag which can be read by the smartphone's NFC reader. The tag has the identification number and it will be automatically linked to user's app.

Communication between the physical module and the app

The connection between physical modules is through a hardware input. Instead of using physical pins to connect a module with another, it will have a reed switch inside on all six sides. The reed switch acts as a button and it will be activated by a magnet.

To communicate between the physical modules and the app, a microcontroller and

a hub are needed. The microcontroller, an Arduino Nano 33 IOT, is capable of manage the switches and communicate with the hub through encrypted WiFi. The hub, which acts as a middleman will receive information from the microcontroller and sends it to a server or stores and processes itself. The hub can be made by using a Raspberry Pi. It monitors which Hexabonds are active and connected.

When two physical modules are connected, the switch will be activated and it will send a signal to the hub. This signal will be timestamped which is needed to "time sync connect". The hub will link the two physical modules with the same timestamp.

On software level, the two users will get a feedback on the app when this link is made.

Further, the product needs a LiPo battery that will be charged wirelessly.

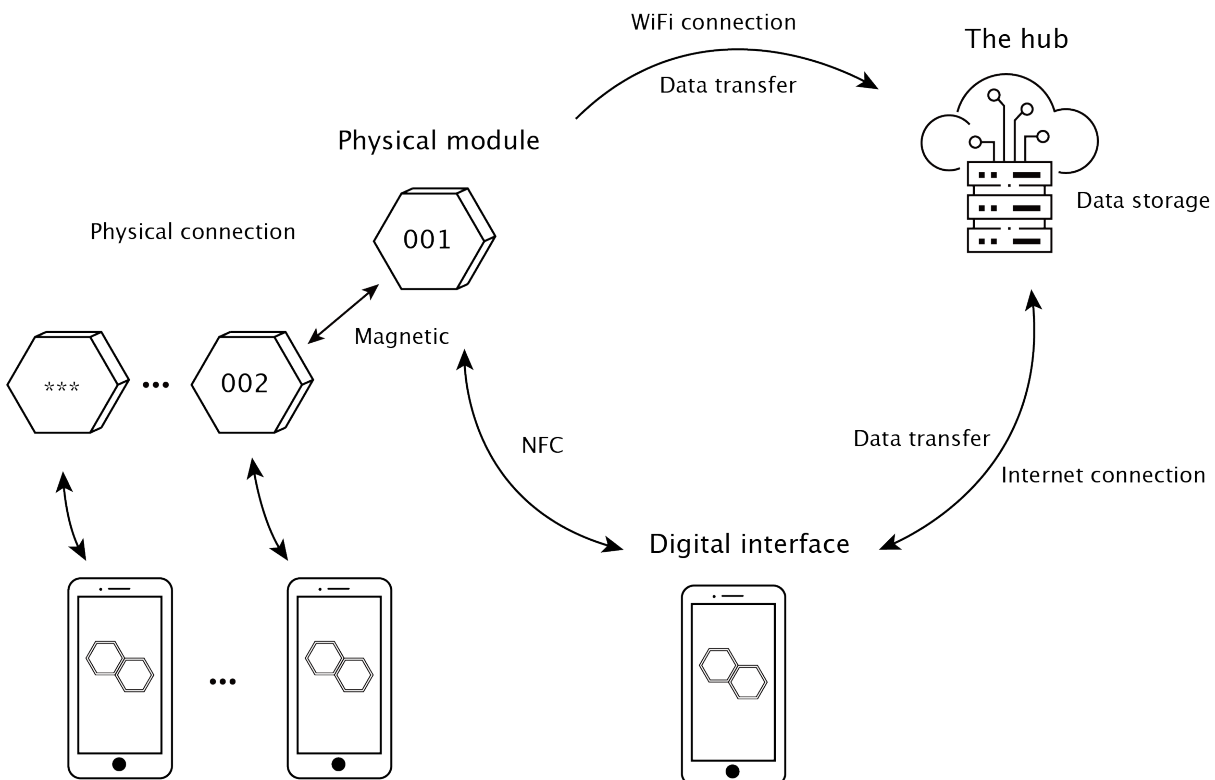


Figure 19. Digital service system map

8. EVALUATION

FINAL EVALUATION

The last phase of design process is to evaluate the final design with graduating students and potential users.

The final evaluation has two goals: validate whether the final design meet my design goal and evaluate the usability of the product system.

Questions for the evaluation are :

- 1. How's the system's usability (System usability scale)?
- 2. How well does the final design meet my design goal?
- 3. What are the pros and cons of the final design?

Research method

I invited 4 participants to take part in the online evaluation session. Two of them are graduating students from Delft Design Labs, the other two are second year master students from IDE faculty. The test was conducted online through Zoom by sharing my screen with the participants.

The test started with a short introduction to the project and my final design. After that, the participants were guided through a user journey for the details of the final design. After that, they were asked to fill in a system usability scale and an design goal evaluation form online. In the end, a short interview was conducted for comments for the final design.

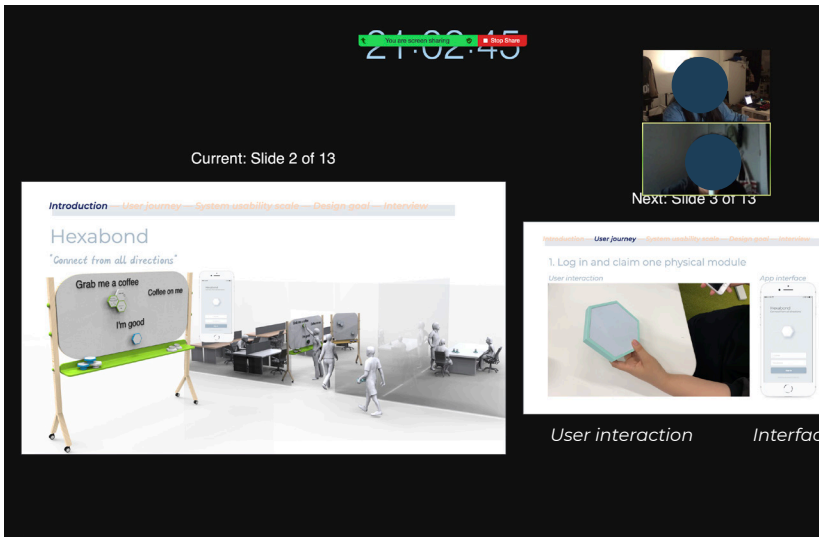


Figure 20. Picture of the online

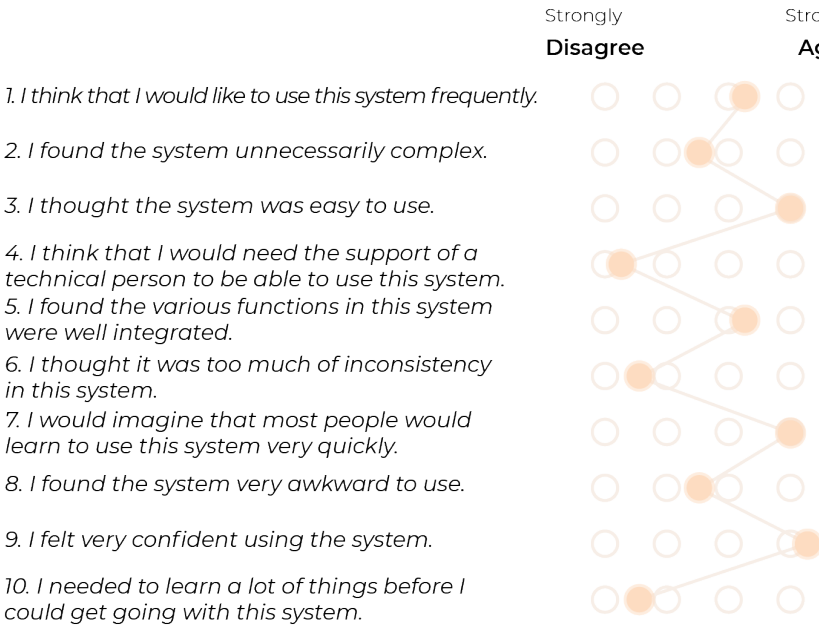


Table 3. Average score for system usability :

Result

Quantitative results

By calculating with SUS scoring method, the score of the product system is 75.8. According to Bangor (2008), SUS score from 68 – 80.3 is regarded as Good. Therefore, the usability performance of the product system is good in terms of effectiveness, efficiency, and overall ease of use. Table 3 shows the average system usability score.

Figure 21 shows the comparison of average scores of the final design and the previous version. The final design performs better in terms of meeting design goal 1, 3 and 4. Design goal 2 is well met with both versions. The final design did not perform as expected for meeting design goal 5.

Qualitative feedback

All participants are positive about the idea behind the design. They have felt the need for connection during a solo design project. By merging a social activity with coffee routine, it is quite natural and it lowers the boundary for people to interact.

However, two of the participants were a bit skeptical about maintaining the connections. Although the app provides a way for users to check on others' project process and information when they are away from the workplace, there is no further engagement. Students might feel not motivated to upload progress.

Conclusion

Based on the evaluation, the final design performs good on helping with creating connections among students in a shared workplace. It encourages students to help each other out during a solo project period. And it has the potential to be implemented in other shared workplaces where more people can get involved in. It provides the opportunity for students to get to know each other, which is a start point for them to build stronger relationships. The usability of the product system is also regarded as good.

Maintaining the connection is not well supported by the design, which is an opportunity for the design to further developed.

- Previous version
- Final version

1. How much do you think it helps to make you feel a sense of belonging at the workplace?
2. How much do you think it helps you to create connection with other students at the workplace?
3. How much do you think it encourage you to ask for help at the workplace?
4. How much do you think it encourage you to offer help at the workplace?
5. How much do you think it helps to maintain the connection with others even when you are away from the workplace?

Help/encourage/use
Not at all

Help/encourage/use
Very much

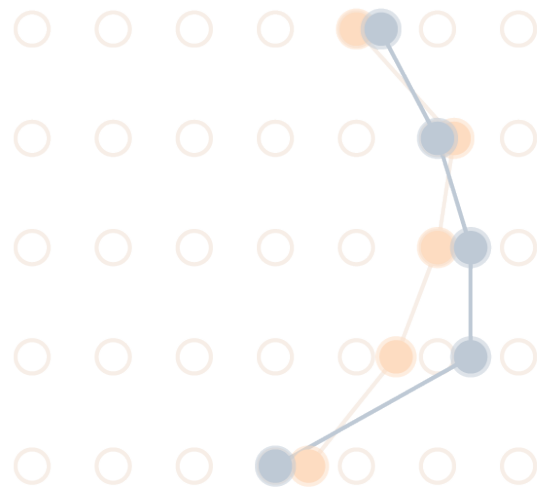


Figure 21. Comparison of scores of two design versions

CONCLUSION

Good working environment has a positive influence on the physical and mental wellbeing of people. The result is not only increased working performance but also happier people. This is what Delft Design Lab workplace also trying to achieve. The space brings cross-disciplinary graduation students together with an ambitious to help them to collaborate with each other. Unfortunately, this does not happen as aspired. People are not actively looking for collaboration and only work on their own project. Therefore, DDL workplace has potential for a better workplace.

To design the future Delft Design Lab workplace, research was done to find valuable insights and to explore opportunities.

The workplace provides all necessary tools and components to work efficiently. Comfortable chairs, big desks, access to facilities and a quite environment. From results of the survey, the current workplace was very much appreciated for supporting focused work. Working in the workplace has a positive influence on the motivation to work.

DDL workplace is used by graduation students. Working on graduation projects on ones own is a stressful time and it challenges students' mental wellbeing in terms of autonomy, competence and relatedness. However, the current workplace does not support students' wellbeing well enough.

From survey and interviews, it was found that students are willing to interact with

peers, but due to intense project time and different schedules it is hard to do so.

Students are also avoiding interrupting others, working in silence. Due to this situation, people are not actively seeking for collaboration. Though, people from the same lab do still collaborate, but people from different labs are less likely to help each other out as they do not know each other, and they are also unaware of each other's project and their progress stage. People do not have much opportunities to get to know each other.

The need for a workplace is apparent since COVID-19. People do need peer support and to see other people. When working from home, people miss the direct contact with others.

Through research and analysis, a number of design opportunities were found for the creation of a product/service. After choosing a design direction, the design vision was formulated as:

"Make DDL workplace a place where students can create and maintain bonds with each other. And bond refers others within a community"

The Hexabond encourages meaningful interactions between students, without disturbing everyone. It gives the user an opportunity to connect and interact with others, which can be a start point for students to get to know each other.

The user can write on the physical module which gives it a personal touch. The coffee holder gives the product a second meaningful interaction. Bringing someone a cup of coffee is a gesture of socializing and interacting. Combining the physical module with internet of things technology, it creates a product system that brings people together through analogue means with digital support. The digital app supports the service of the product system. It's also an extension of the physical workplace to maintain the bond and contribute to creating the DDL community.

The Hexabond is simple to set up and does not require precious time investment. Aesthetic of the products is simple and minimalistic and makes it fit into any workplace.

For validation of the Hexabond, some prototypes were created for user tests. The results of the test showed that the final design met the design goals well. The resulting product fulfils the need for encouraging students to offer and ask for help in the workplace, creating connections between students and making students feel a sense of belonging. However, there is still room for improvement for maintaining the connections between students.

The biggest limitation during the project is the unfortunate pandemic. Making it impossible to do user tests in the DDL workplace or in general. The current design is still rather hypothetical and is not fully validated with the right usage. The product is rather a user-centred design which needs input and feedback from the user group. If it was possible to actually test the product in a shared workplace with the students, it would have yielded insightful feedback for iterations.

RECOMMENDATION

Physical product

Aesthetic

The current design of the Hexabond follows minimalist design, but currently is a little too simple. Smaller details, like fillet edges, are missing for making a minimalist design more elegant.

Smart products usually have a certain design aesthetic. It looks minimalist and all the complexity is hidden. Only some LED lights are visible, that shows different kind of interactions. For example it can flicker to show that someone is connected. Or when a circular LED is used, it can light up in a circular motion to show that the maximum amount of connected people is reached. The reason is to interact with the product without having to open the app. It shows direct feedback when something is happening. The Hexabond does not show anything at the moment and so it lacks the feeling of a smart product.

Materialization of the product could also be improved. It is now made out of glossy plastic, that might attract lots of fingerprints. If it gets scratched, it is rather obvious and unpleasant to see. To fix this issue, a matt finish would avoid fingerprints and obvious scratches. Other materials like rubber or TPU would also be interesting as it gives the product a soft touch feel and it absorbs the impact when someone drops it by accident.

Production

For early development of the product, it could be done by 3D printing. It would be most cost efficient. There will be no tooling costs. If the product needs changes or new parts, it can be easily reprinted. It can be printed in different colours and materials. To make the modules even more personal, one could choose their own colour scheme.

If the Hexabond becomes a product that will be used more widespread, mass manufacturing will be needed. As the parts are fairly simple in design and only consists of two pieces, tooling costs would be fairly low. Injection moulding the parts is fastest and yields great quality.

Instead of buying Arduino, a custom PCB with components could be made. It is widely available to let it manufacture and it will cut down the cost in the long run. If only small batches are made, Arduino will be best option as it is reliable and supported by a big community.

Digital service

Planning & Management

The app could have some more functionality, like project planing. People can use the app for managing their project. It gives the app additional features that supports the students with their graduation.

Privacy issue

During the final evaluation, participant mentioned that she felt being spied on when someone can check her attendance from a distance. Therefore, users should be able to hide if they're not willing to share their status.

Maintain connection

The digital app does not perform as expected to maintain connections when students are away from the workplace. Further research and user tests are needed to find a possible solution.

REFLECTION

Project management

Working individually on a graduation project is challenging. In a team project, we always separate tasks according to each member's strength, but in a graduation project, everything has to be managed by myself, from conducting research to decision making.

Improving the DDL can be done in countless ways, but they weren't really obvious to me in the beginning. Here I experienced that analysing the space and the users was really the key to find the design direction. By applying different research methods, I gained valuable insights from the user group. Furthermore, co-creation is a process I have often heard of but never used it myself. Applying this process in this project resulted in some good design opportunities. It is really good to directly interact with potential users. It shortens the design process a bit by making quicker decisions and getting immediate feedback.

Making decisions is always a tough thing for me, but through graduation project I started to learn how to make design decisions. Sometimes you not only follow design methods such as C-box, but also trust your designer gut.

From the overall project, I gained experience on running an individual project. However, it also makes me realize that I prefer working in a multidisciplinary team where members take responsibilities and cooperate.

Adapt to working from home

The pandemic was something that struck everyone. No one expected it went so fast and how big the impact it had on the society. It was a troublesome period for me as well. Not being able to work in DDL workplace was quite challenging for the project that design for the physical environment. But there is also upside because of the situation. People work there will know what they actually miss about DDL workplace. This is often not that obvious when you always work at a certain location.

Due to the pandemic, working from home was quite tough in the first few months. From my research and analysis, I found that people get motivated to work with people around them. I can confirm that it is true, it was hard to concentrate and stay focussed when working alone. Luckily, by joining voice channel and offline chattings with friends, I gradually adapted to working from home.

Overall

Looking back at the whole project, it was quite a challenge but really interesting. The pandemic added another level of difficulty but also an eye opener for the issues in the current workplace.

At the start of the project, I was rather enthusiastic about improving Delft Design Lab workplace, as me myself is my target user. Another reason was that I found myself very much interested in designing for a physical environment after my elective course, lighting design. I imagined to create

a nice working experience through playing with physical elements.

Although the design direction was altered due to the unexpected situation, I am rather satisfied with the final result. The project fits within my design goal and there was enough room to apply new knowledge from IPD. The Hexabond can be valuable in many shared workplaces, where people can start to connect with each other and help each other out.



ACKNOWLEDGEMENT

At the end of the journey, I would like to express my thanks for everyone who have supported me through this challenging time:

Tomasz

Thank you for your guidance throughout the project. Giving me helpful feedback and providing me with methods to continue certain processes.

Pieter

Thank you for your support and constructive feedback to the project. Providing me with tips that led to the right direction of this project.

All the participants

Thank you for helping me in conducting research and collecting the needed insights. Also, for cocreating the final product.

Members of Living Office Lab

Thank you for the inspiring discussion during the online cafes and the voice channel for motivating me to work from home.

Friends

Thank you for your continued support and motivating me to keep working. Also for the hotpots and barbecues to boost the morale.

Yixiang

Thank you for your daily support and technical support of the product.

Family

Thank you for your love call from China for supporting me study oversea.



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APPENDIX A

Original project brief

DESIGN
FOR our
future

3979

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

1 USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT

Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according to the format: "IDE Master Graduation Project Brief_ familyname_firstname_studentnumber_dd-mm-yyyy". Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name Huang
initials X given name Xinyu
student number 4805550
street & no. _____
zipcode & city _____
country _____
phone _____
email _____

Your master programme (only select the options that apply to you):

IDE master(s): ☒ IPD ☐ DFI ☐ SPD
2nd non-IDE master: _____
individual programme: _____ (give date of approval)
honours programme: ☐ Honours Programme Master
specialisation / annotation: ☐ Medisign
☐ Tech. in Sustainable Design
☐ Entrepreneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair Pieter Desmet dept. / section: HCD/DA
** mentor Tomasz Jaskiewicz dept. / section: ID/DCC
2nd mentor _____
organisation: _____
city: _____ country: _____
comments (optional) _____

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

Procedural Checks - IDE Master Graduation

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Pieter Desmet date 16

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs). The study progress will be checked for a 2nd time just before the graduation.

Master electives no. of EC accumulated in total: 27 EC

Of which, taking the conditional requirements into account, can be part of the exam programme 27 EC

List of electives obtained before the third semester without approval of the BoE

name _____ date 17

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the conditions. Next, please assess, (dis)approve and sign this Project Brief, by using the checkboxes on the right.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)? ☒
- Is the level of the project challenging enough for a MSc IDE graduating student? ☒
- Is the project expected to be doable within 100 working days/20 weeks? ☒
- Does the composition of the supervisory team comply with the regulations and fit the assignment? ☒

name Monique von Morgen date 30-3

IDE TU Delft - E&SA Department /// Graduation project brief & study overview

Initials & Name X Huang

Title of Project Design the future Delft Design Lab workplace

Design the future Delft Design Lab workplace

project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 10 - 03 - 2020

21 - 08 - 2020 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

A physical work environment is essential for creating and supporting different activities in the workplace, not only for work performance but also for physical and mental wellbeing. Studies have been conducted on the influence of the office environment on work performance and employees' wellbeing since 1950s. Most of these studies have been published in the domains of ergonomics and human factors or in historical papers on the office environment (Katja, 2019). In recent years, motivated by an increasing demand for wellness-focussed design, companies and organizations are putting more effort in investing in properties that improve employee's performance while enhancing their wellbeing in the workplace (Zack, 2019), exploring opportunities of new emerging technologies.

Currently, coworking has become one of the new standards shaping the future of workplace. In 2017 there were 1.74 million people working in a coworking space in the whole world. It is expected that this number will grow to 5.1 million in 2022 (GCUC & Emergent Research, 2017). As a traditional coworking layout, open offices are often considered promoting collaboration since it has no barriers such as walls and doors which normally separate different areas. However, unintended consequences have been found through research. For example face-to-face interaction as well as overall productivity decreased for most employees (Bernstein & Waber, 2019).

Similarly, the Delft Design Lab (DDL) workplace has also taken the global trend of coworking-spaces to establish a university open office, but still struggling with the disadvantages of open offices. The DDL workspace consists of a room with fourteen non-assigned desks, a small meeting room and a small concentration room. The workplace is shown in Figure 1.

The users of the workplace are students who work on their graduation projects for Delft Design Labs. They are provided with the workplace with flexible working times. The students have the freedom to whether work at the workplace or not. Recent research has found out that the main motivation for co-workers to work in a co-working space were that they wanted to work in an inspiring but also affordable work environment. When choosing a particular co-working space, accessibility and atmosphere/interior are the most valued (Weijs-Perrée, van de Koevering, Appel-Meulenbroek, & Arentze, 2019). However, insights about how to cope with students' preferences by offering co-working spaces in the DDL workplace is yet to be gained from the survey and interviews.

References:

Sterkenberg, Z. (2019, December 4). Office Futures: The Office Design Trends of 2020 and Beyond. Retrieved from <https://www.ambius.com/blog/2020-office-design-trends/>
2018 Global Coworking Forecast: 30,432 Spaces and 5.1 Million Members by 2022. (2018, November 20). Retrieved from <https://usa.gcuc.co/2018-global-coworking-forecast-30432-spaces-5-1-million-members-2022/>
Bernstein, E., & Waber, B. (2019, October 22). The Truth About Open Offices. Retrieved from <https://hbr.org/2019/11/the-truth-about-open-offices>
Weijs-Perrée, M., van de Koevering, J., Appel-Meulenbroek, R., & Arentze, T. (2019). Analysing user preferences for co-working space characteristics. Building Research and Information, 47(5), 534-548. doi:10.1080/09613218.2018.1463750

space available for images / figures on next page

3 - 2020

signature

Student Affairs), after approval of the project brief by the Chair.
een light meeting.

☒ YES all 1st year master courses passed

☐ NO missing 1st year master courses are:

3-2020

signature

ask the supervisory team and study the parts of the brief marked **.
g the criteria below.

Content: ☒ APPROVED ☐ NOT APPROVED

Procedure: ☒ APPROVED ☐ NOT APPROVED

comments

-2020

signature

MvM

introduction (continued): space for images



image / figure 1: Current DDL workplace



image / figure 2: An example of open office from Steelcase

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one EC (= 20 full time weeks or 100 working days) and clearly indicate v

1. the main problem

In this project, I want to understand the intricacy of the current workplace. The main problem of the project is how to address the wellbeing in the workplace.

2. the scope of the project

To complete the project within the required time, I will focus on student wellbeing in the workplace.

The physical environment can be described as anything that can be touched, smelled, sighted, heard, and/or tasted. The wellbeing is achieved by balancing autonomy (doing things one's own way), competence (having control over the environment), and competence (having control over the environment). Considered; e.g. the perfect ergonomic chair will not be res

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create, or out in "problem definition". Then illustrate this assignment by indicating an instance: a product, a product-service combination, a strategy illustration, a case of a Specialisation and/or Annotation, make sure the assignment

The assignment is about designing the physical environment, relatedness, and competence in the workplace. The final deliverable is implemented in the current DDL workplace.

As mentioned above, the main problem of the project is how to address the wellbeing in the workplace.

In order to make the problem more clear and easier to solve

- What are the relationships among autonomy, relatedness
- What are the external factors which will influence autonomy
- How to trigger personal connections among the students
- How to make the students feel in control of the workplace
- How to make the students feel in control of their working
- What's the desirable balance among the three emotions fo

Method

A dual approach will be used: a bottom-up approach (with a focus on the basic human needs) and a top-down approach (using Self-Determination Theory to motivate the users to come to DDL workplace and exploring basic human needs).

that is manageable within one Master Graduation Project of 30 EC. What issue(s) should be addressed in this project.

current situation and to develop a future ideal concept for DDL that adds value to the workplace to support the student wellbeing in the workplace.

focus on designing the physical environment for facilitating student wellbeing.

at a user can experience physically through feelings, such as stress, which can lead to mental wellbeing in this project, which will be related to the physical environment and working process. Ergonomics will not be fully researched or designed.

date and / or generate, that will solve (part of) the issue(s) pointed out. What kind of solution you expect and / or aim to deliver, for example, a new product or product-service combination ideas, ... In the final report, you should reflect this/these.

for facilitating student wellbeing by balancing autonomy, competence and relatedness. A deliverable should be a tested product/system that can be used in the workplace.

to add value to the workplace to support the student wellbeing.

several research questions are listed below:

- What are the competences and skills needed for student wellbeing?
- How can these competences and skills be supported in the workplace?
- How can the workplace be designed to support student wellbeing?
- How can the workplace be designed to support student wellbeing?
- How can the workplace be designed to support student wellbeing?

co-creation, the situated needs of the current users will be taken into account. Design Theory (relatedness, competence, autonomy) to support student wellbeing. How (interactions in) the DDL space can support these needs.

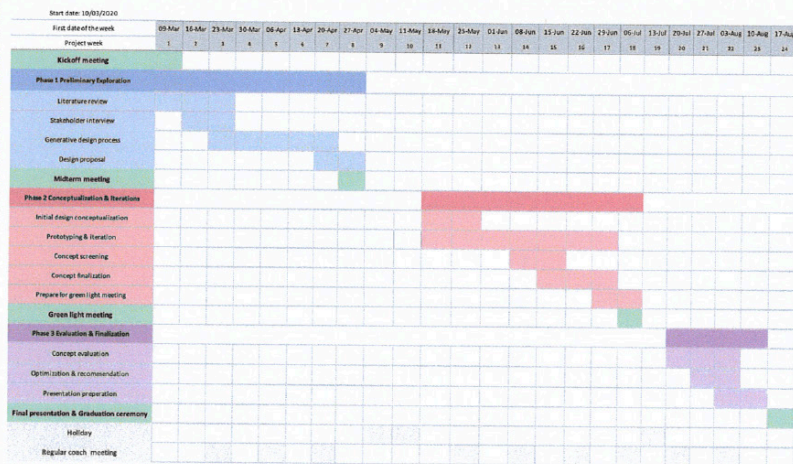
Personal Project Brief - IDE Master Graduation

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 10 - 3 - 2020

21 - 8 - 2020 end date



The first phase (8 weeks):

Literature review (2~3 weeks): Desk research will be done to deeply understand how the workplace will influence the behavior and wellbeing of the people. In the meanwhile, the insights will be implemented and tested in the workplace in a simple way. Stakeholder interview (2 weeks): During the interview, more insights will be gathered from the students working in Delft Design Lab. Also, a workshop will be conducted in the workplace to evaluate the current situation. Generative design session (5~6 weeks): After obtaining enough insights, the design generation will start with divergent exploration and end up with several design proposals formulated from the insights of the above activities. Midterm meeting: The proposed concepts will be discussed in terms of the added value to the workspace and the possibility of the implementation of each proposal.

The second phase (9~10 weeks)

Initial design conceptualization (3~4 weeks): After the midterm meeting, one or several proposals will be chosen to develop further. Rapid prototyping will be used to test each concept. Several design iterations will be conducted using the insights from the tests. Concept screening (1~2 weeks): Evaluated by the design criteria, only one concept will be chosen as the final concept. Concept finalization (3~4 weeks): This concept will be finalized and a functional prototype should be ready to test before the green light meeting.

The third phase (4~5 weeks)

Concept evaluation (2~3 weeks): A functional prototype will be tested in the Delft Design Lab workplace. Valuable feedback and insights will be gathered and used for the final optimization and recommendations. Presentation preparation (1~2 weeks): The final presentation slides including other possible display form will be finished for the final presentation.

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... - Stick to no more than five ambitions.

Looking back to my design projects, I've always been passionate about designing for the wellbeing of people. As an important part of people's life, working is a very valuable field for designers. This project gives me the opportunity to have an in depth exploration of designing for workplace, which has a large influence on people's working experience.

After one and half year study under integrated product design, I find myself getting more and more into providing the users with a richer and immersive experience. My bachelor and master education enable me to not only explore in the form and function aspects of a product, but also think about how will the user interact with the product and what kind of experience the product can provide them. From the elective course Lighting Design, I designed for a space for the first time and was impressed by how the spatial light structure influences the appearance of a product or even the whole space. So in this project, I would like to explore more possibilities of designing for a space to provide the users with an improved experience.

I also want to learn the method of co-creation and how to lead a co-creation session. By bring the user group into the design process, I can not only hear their voices, but also empower them to make the design with me.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

APPENDIX B

Insight cards



SOURCE

Data/User wish or statement of need
/Observation

Insight

Insight

LITERATURE

In spaces with a bottom-up logic, members are usually intrinsically motivated. However, in spaces with a top-down approach, motivating individuals to co-work and co-create does not always flow as a matter of course.

For DDL workplace, a strong motivation is necessary for a long-term commitment. Or shape it with a bottom-up logic.

LITERATURE

Users of co-working spaces value working in a co-working space because of casual small talk. knowledge sharing and brainstorming with other co-workers (Desmag, 2015).

-

LITERATURE

People feel lonely when at home and want a better balance between their work and personal life (Fuzi, Clifton, & Loudon, 2014; Moriset, 2013).

-

LITERATURE

Users of co-working spaces value working in a co-working space because of casual small talk. knowledge sharing and brainstorming with other co-workers (Desmag, 2015).

-

LITERATURE

Co-working spaces increase a user's self-efficacy and performance by creating a better balance between work and private life and because of the easy access to a community and professional and social networks (Bouncken & Reuschl, 2016).

-

LITERATURE

Co-working spaces are community-driven environments where co-workers can improve themselves with the help with other co-workers (Sykes, 2014).

In this community, co-workers can find other people, ideas and other resources, share experience, learn from each other and celebrate each other's successes (Moriset, 2013; Waters-Lynch & Potts, 2017).

-

LITERATURE

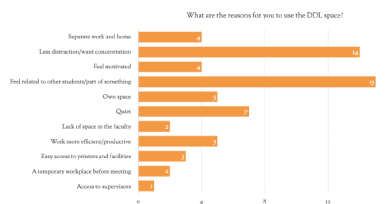
Co-working spaces are **dynamic, inspiring** and low-cost workplaces where people (from different business backgrounds) can interact, share knowledge and co-create (Fuzi,2015; Spinuzzi,2012) .

LITERATURE

Some spaces have a top-down type of governance, which were designed ad hoc by an organization that oversees the innovation process. The others respond to a bottom-up logic, which were created by users motivated by a desire to share and develop a community of interest.

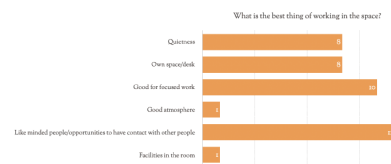
The DDL workplace is more of the top-down type but is not really perceived as a collaborate place by the students who work there.

SURVEY



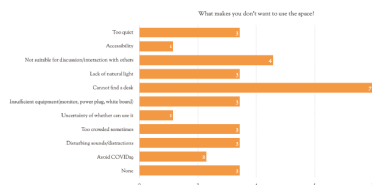
Most students come to DDL workplace to work because they want to **concentrate and have other's company.**

SURVEY



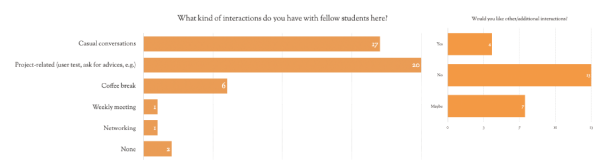
The most valued thing of the current DDL workplace is that it supports students to do **focused work with other's company.**

SURVEY



The current workplace is **not always available for every student and sometimes the balance is off. It also **doesn't** support all the design-related activities.**

SURVEY



Students **do interact with each other in the workplace but want to **keep it simple and project-related.****

SURVEY

"It would be nice if we are able to support each other, but that would also take time from our own projects. "

"More collaborations would be nice. However, this might be better in a different room since silence and concentration is also valued for some students."

Collaboration and supporting each others is nice, but the concentration and focus on **own project is also important.**

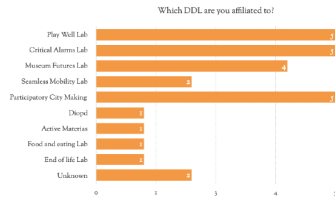
SURVEY

"I live in a studio that is one open space, so when I work at home, there is no clear division between relaxing and working. "

"the space is shared by graduates provides a professional working environment, with little distraction."

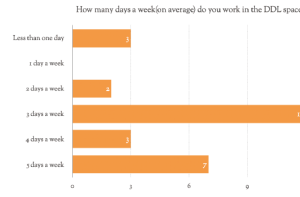
Students prefer to **separate work and home and want a **designated workplace.****

SURVEY



Students who come to DDL workplace to work have different projects and focus areas.

SURVEY



Most students come to DDL workplace to work regularly.

SURVEY

"Students could influence each other negatively. E.g., having chill chats, wasting time together, spreading negative emotions and thoughts to each other."

There might be negative influence from the fellow students.

SURVEY

"With some fellow students I have not yet spoken, this due to them (and me also) giving off an aura of being very pre-occupied and therefore not approachable."

People don't want to bother someone who looks busy working. (Might be wearing a headphone or less active, rarely stand up or getting a coffee/take a break)

SURVEY

"It's super quiet so not so much conversation and makes me nervous to talk but a quick hello when I go in."

"It's super quiet which also makes it stressful to work too many days in a row for me personally."

"I am a person who can only concentrate in silence, so the more people there are in the room, the less likely you will find me there."

SURVEY

"I know from a previous student who just is about to graduate, that he shared a table with someone that was always in the lab before him, even when he came early. Therefore, he felt as if he had no space to work/was not welcome. Maybe by adding a time-schedule for each table with a name, showing when it is who's desk."

Students want to feel welcomed and secured when working in the workplace.

SURVEY

"Sometimes it is too quiet and then I hear myself making every little sound and it distracts me. Then I prefer to work at home where this does not matter. Sometimes it is too crowded and people talk a lot, so then I get distracted as well."

I struggled with this balance, especially when I had to write my report and think very well. So most of the time I wrote at home and did other things like research and preparing material at DDL."

The sound can be a very influential element of the space and a good balance is needed.

SURVEY

"I enjoy the working mood in the DDL space more than in other environments, this combined with the peer support that somehow is possible to have with other students there."

"I think that working with other students is an inspiration. Especially working closely together with other students from my lab."

Students enjoy the peer support provided by the workplace.

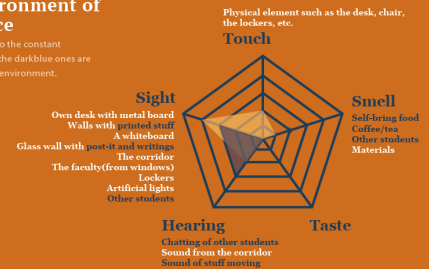
OBSERVATION

Students put stickers and printed materials on the walls of the workplace and the boards attached to the desks.

Students want to give the workplace a creative character and more personalized.
Visual information is preferred for inspiration and motivation.

Physical environment of DDL workplace

The yellow ones contribute to the constant physical environment while the darkblue ones are the variables of the physical environment.



OBSERVATION

There's only one small window in the main area and no natural light come in.

Students don't have much access to nature or other views.

OBSERVATION

There are some students wearing headphones during working.

Students want to concentrate on the work and don't want to be bothered (also don't want to bother the others) .

OBSERVATION

There's only one small window in the main area and no natural light come in.

Students don't have much access to nature or other views.

OBSERVATION

Some students have "claimed" desks by putting their project-related stuff. Some wrote a note with a name and the project name.

Students prefer to have a dedicated workplace.

OBSERVATION

The meeting room has been using for shooting videos(recently).
The concentration room has been using for storage.

There's no clear rules about this workplace, students might use it as what they think it's suitable.

INTERVIEW

"I feel like I have a delay in my everyday working schedule. I work from 9am to 5pm the first days, but now it's more like 10am to 6pm, or even later."

"My daily schedule is messed up, I usually follow the faculty's schedule. When there's more people in the hall or when it's getting more noisy, I know that it's time for a break.

The sense of time gets weaker when working from home.
The environment should help with building a regular working schedule.

INTERVIEW

"I can play music with my speaker and don't have to set up the working table."

"I don't need to prepare for my lunch or spend time commuting."

"Sunshine. Better lighting and bigger space."

The positive side of working at home: Natural light, no commuting time, more cosy environment, dedicated/-self-designed workplace.

INTERVIEW

"I can't just walk in and ask the experts for help but have to email them. It's way less efficient."

"I miss the printers and other facilities in the faculty. I'm now worried about the prototyping phase and user testing of my graduation project."

"I can't stand working. Less social connection."

"There's a lot of distractions, such as my kitchen."

"I can only write on the paper now, I miss the whiteboards."

Students need a place where experts could be approached, access to certain facilities and division between home and work.

INTERVIEW

"Once I was preparing for my meeting but someone was talking on the phone pretty loud. I know it was lunch time but I still want to work."

Students have different work time and preferences, which might interfere with each other.

INTERVIEW

"When I do team work we always check with each other what we've done and if there's any question, it motivates me to finish my work on time. But when I work alone I feel less pressing."

Expectation from the others help with motivating students to work more disciplined.

INTERVIEW

"I like the lighting in the faculty, my room is quite dark. I want bright light on my table. It makes me more focused on what I'm doing."

Area lighting helps with creating the work atmosphere.

INTERVIEW

"I will put stuff in the locker first, only bring the needed stuff to the silence room, such as laptop and printed materials. Then arrange the working table."

An easier setting up process might help with working more efficiently.

INTERVIEW

"I feel more active when I work in the faculty, I sometimes walk around for coffee or a chat with others."

A multi-functional space motivates students to walk around and have short breaks.

INTERVIEW

"I miss the people around me, when we were sitting together studying I can ask them questions."

"I can't start a video call whenever I want."

"I might get the respond hours later."

People want instant feedback.

APPENDIX C

Online survey result

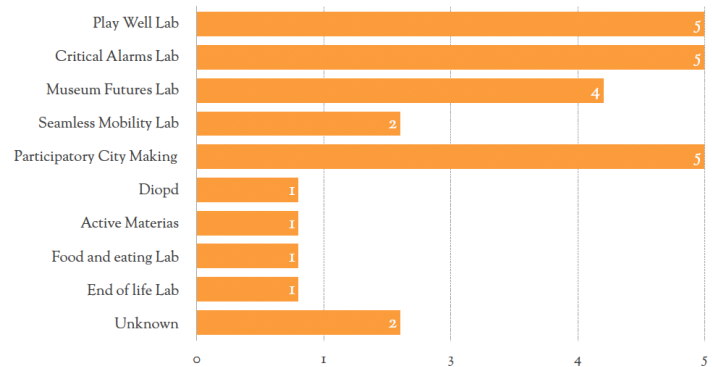


Valid questionnaire: 27

Which DDL are you affiliated to?

DDL	NUMBER
Play Well Lab	5
Critical Alarms Lab	5
Museum Futures Lab	4
Seamless Mobility Lab	2
Participatory City Making	5
Diopd	1
Active Materias	1
Food and eating Lab	1
End of life Lab	1
Unknown	2

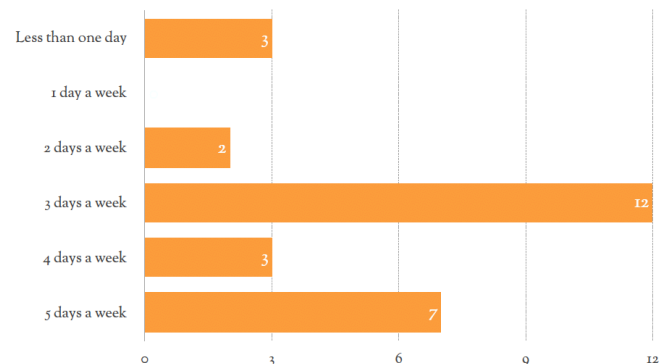
Which DDL are you affiliated to?



How many days a week(on average) do you work in the DDL space?

	NUMBER
Less than one day	3
1 day a week	0
2 days a week	2
3 days a week	12
4 days a week	3
5 days a week	7

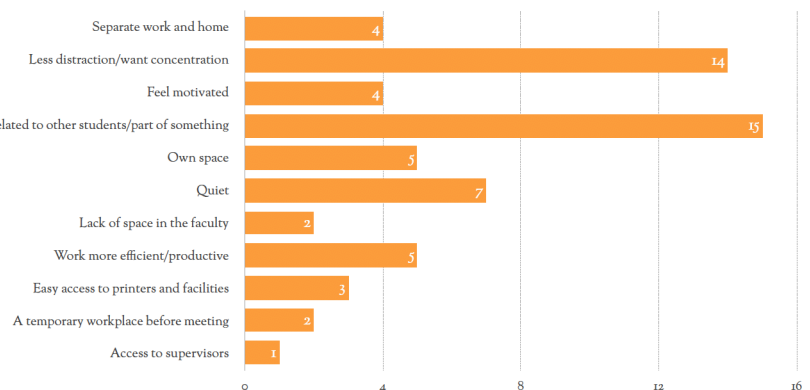
How many days a week(on average) do you work in the DDL space



What are the reasons for you to use the DDL space?

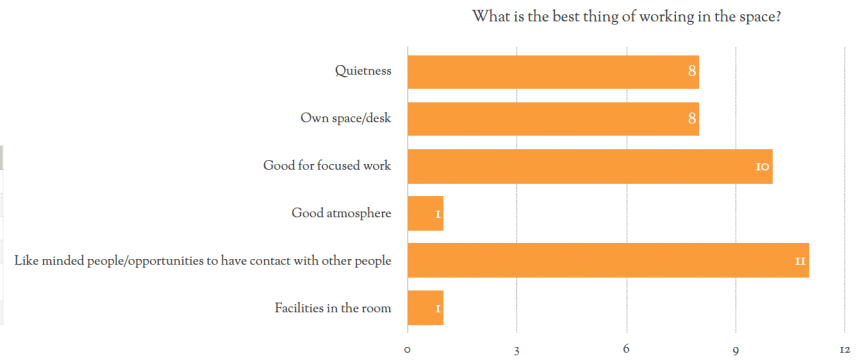
REASONS	NUMBER
Separate work and home	4
Less distraction/want concentration	14
Feel motivated	4
Feel related to other students/part of something	15
Own space	5
Quiet	7
Lack of space in the faculty	2
Work more efficient/productive	5
Easy access to printers and facilities	3
A temporary workplace before meeting	2
Access to supervisors	1

What are the reasons for you to use the DDL space?



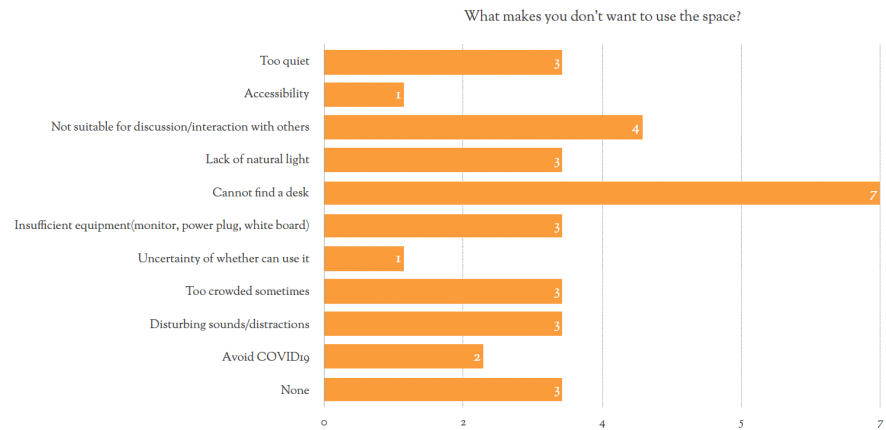
The best thing of working in the space

	NUMBER
Quietness	8
Own space/desk	8
Good for focused work	10
Good atmosphere	1
Like minded people/opportunities to have contact with other people	11
Facilities in the room	1



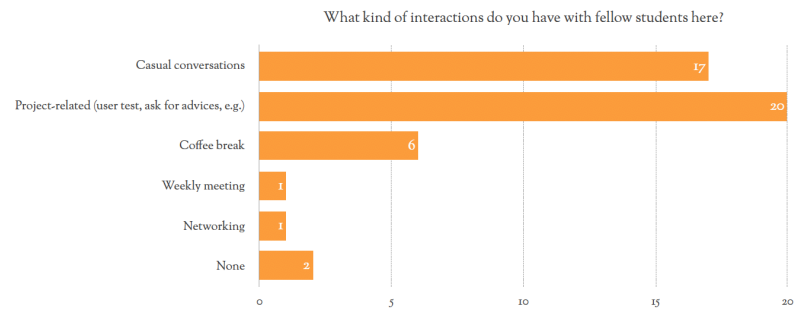
What makes you don't want to use the space?

	NUMBER
Too quiet	3
Accessibility	1
Not suitable for discussion/interaction with others	4
Lack of natural light	3
Cannot find a desk	7
Insufficient equipment(monitor, power plug, white board)	3
Uncertainty of whether can use it	1
Too crowded sometimes	3
Disturbing sounds/distractions	3
Avoid COVID19	2
None	3



What kind of interactions do you have with fellow students here?

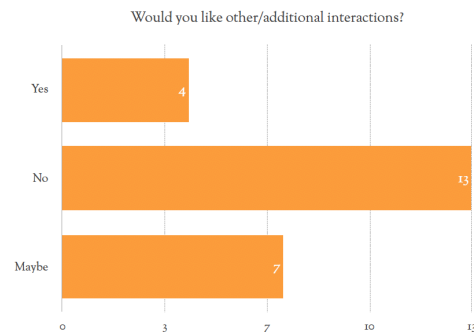
	NUMBER
Casual conversations	17
Project-related (user test, ask for advices, e.g.)	20
Coffee break	6
Weekly meeting	1
Networking	1
None	2



Would you like other/additional interactions?

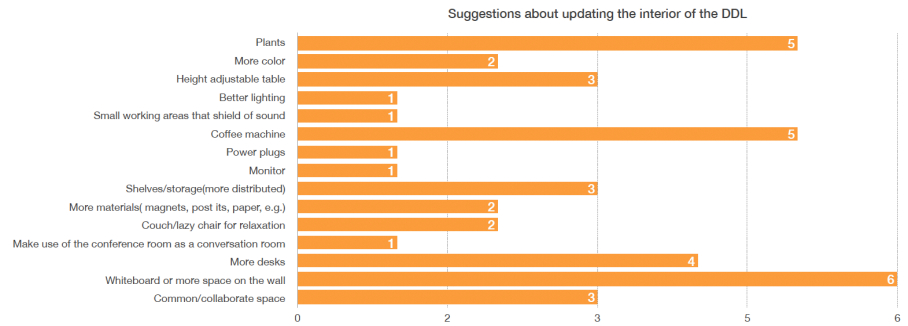
	NUMBER
Yes	4
No	13
Maybe	7

No: value the quietness, do not want to interact all the time, depends on which phase of the project
 Maybe: suggest to do it in a different space and need good balance between interaction and focused work
 Yes: more collaborating about projects, but not too much



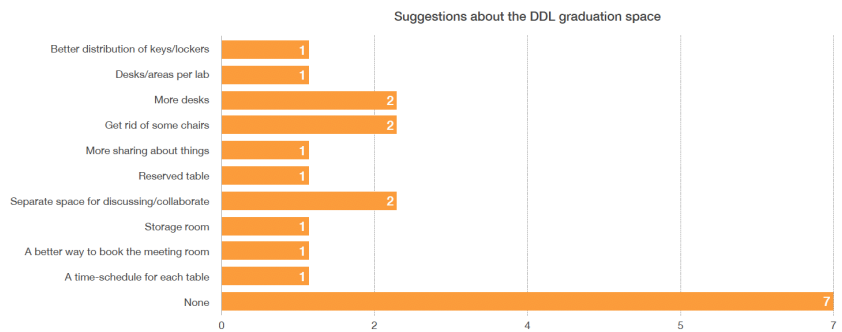
Suggestions about updating the interior of the DDL

	NUMBER
Plants	5
More color	2
Height adjustable table	3
Better lighting	1
Small working areas that shield of sound	1
Coffee machine	5
Power plugs	1
Monitor	1
Shelves/storage(more distributed)	3
More materials(magnets, post its, paper, e.g.)	2
Couch/lazy chair for relaxation	2
Make use of the conference room as a conversation room	1
More desks	4
Whiteboard or more space on the wall	6
Common/collaborate space	3



Suggestions about the DDL graduation space

	NUMBER
Better distribution of keys/lockers	1
Desks/areas per lab	1
More desks	2
Get rid of some chairs	2
More sharing about things	1
Reserved table	1
Separate space for discussing/collaborate	2
Storage room	1
A better way to book the meeting room	1
A time-schedule for each table	1
None	7

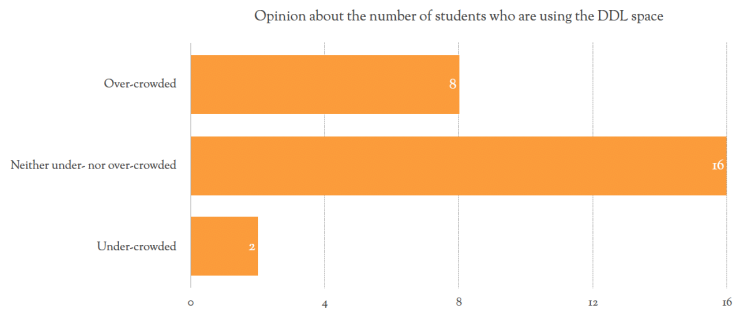


Opinion about the number of students who are using the DDL space

	NUMBER
Over-crowded	8
Neither under- nor over-crowded	16
Under-crowded	2

Elaborations on the answers:

- It isn't always clear if a desk is available or not (some are with other peoples' stuff), and this could be a reason for someone not to work in the DDL space as they will think the desk is someone else' s spot
- In the room itself you don't see it being over-crowded as people will find another place to sit if this place is full
- It's quite random if the space is crowded or not but most of the time 70% of the desks are occupied
- There isn't enough desks for all students to have their own space but there's enough space to work randomly. However, people prefer to have their spot.



APPENDIX D

Shared workplace inspirations

Taipei, Taiwan



Collaborative space



Breakout space



Eatery



Conference room



Meeting space

Kreuzberg – Berlin, Germany



Workstations



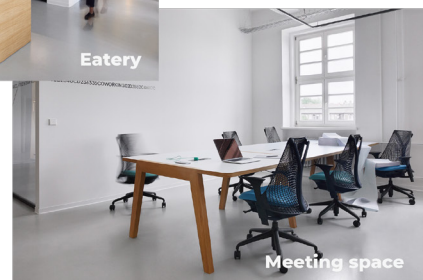
Breakout space



Eatery



Conference room



Meeting space

Madrid, Spain



Lounge



Communal space



Conference room



Working pod

Hochdorf, Switzerland



Coworking space



Quiet focus area



Meeting space/kitchen



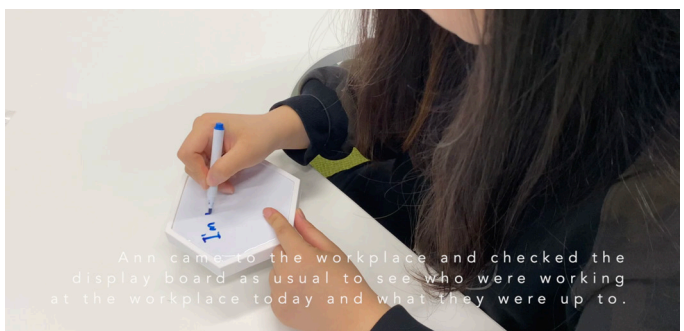
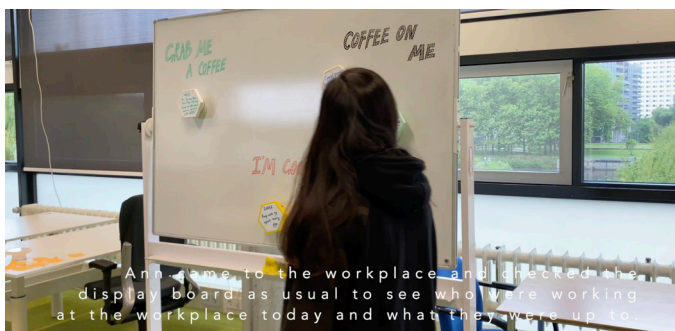
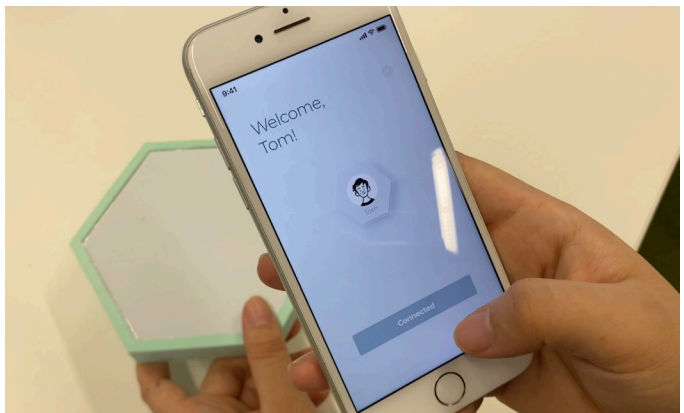
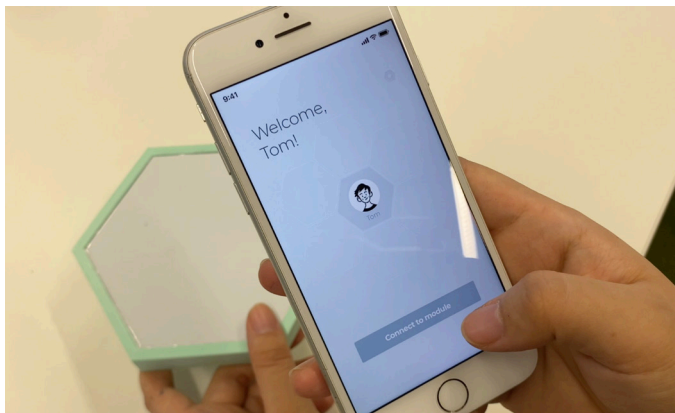
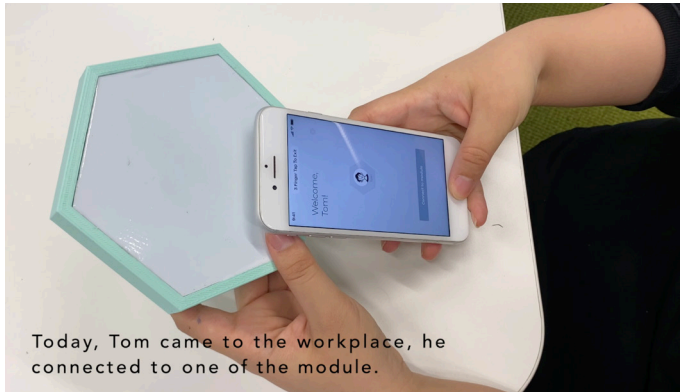
Presentation space

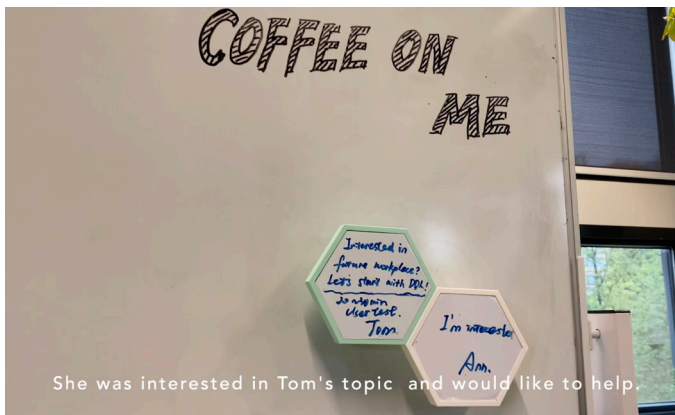


Workshop room

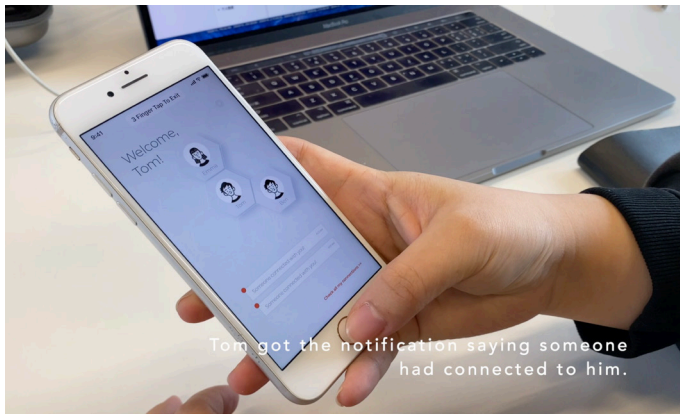
APPENDIX E

Online user test video





She was interested in Tom's topic and would like to help.



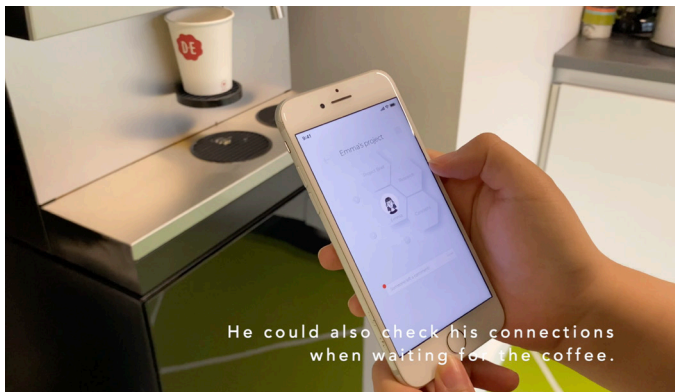
Tom got the notification saying someone had connected to him.



He took the modules, which were transformed into a coffee holder.



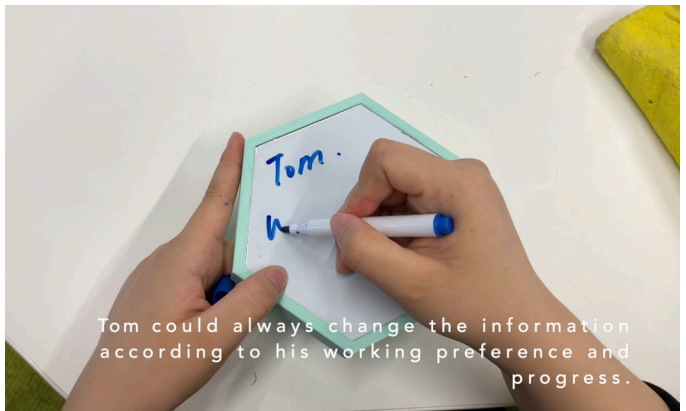
He took the modules, which were transformed into a coffee holder.



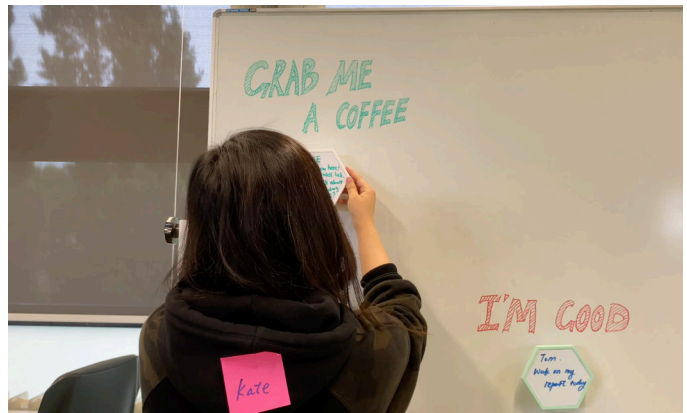
He could also check his connections when waiting for the coffee.



They enjoyed the coffee together and had a warm chat.



Tom could always change the information according to his working preference and progress.



It can also be a tool to search for help and find people with similar interests or topics.

