“The Worry Cloud”
A design with a tangible and embodied approach to reduce stress among university students

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Abstract

A common problem among students is stress which usually correlates to bad sleeping habits. As the stress levels among students are rapidly increasing year by year, the importance of relieving that stress increases as well. One could assume that a suitable aid for stress relief targeted for students would be used during school work, which findings showed to not be the appropriate solution. Findings in this thesis determine the home environment to be where students are the most stress, notably at bedtime where they tend to think and worry. The thinking and worrying were found to be a key issue to stress among students. The proposed solution called *The Worry Cloud* aims to relieve the students of their worries in order to help them to wind down, reduce the stress and help them sleep better.
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Table of Contents

1 INTRODUCTION .......................................................................................................................... 6
   1.1 BACKGROUND .......................................................................................................................... 6
   1.2 PURPOSE .................................................................................................................................. 6
   1.3 INTENDED TARGET GROUP ...................................................................................................... 7
   1.4 DELIMITATIONS .......................................................................................................................... 7
   1.5 RESEARCH QUESTION .............................................................................................................. 7
   1.6 ETHICS ...................................................................................................................................... 7

2 THEORY ......................................................................................................................................... 8
   2.1 INTERACTION DESIGN ............................................................................................................. 8
   2.2 USER EXPERIENCE DESIGN .................................................................................................... 8
   2.3 EMOTIONS AND USER EXPERIENCE ....................................................................................... 9
   2.4 TANGIBLE AND EMBODIED INTERACTION ............................................................................ 9
   2.5 STRESS ..................................................................................................................................... 10
   2.6 STRESS MANAGEMENT ............................................................................................................ 10
      2.6.1 Breathing Techniques ........................................................................................................ 10
      2.6.2 Meditation and Mindfulness ............................................................................................. 11
   2.7 SLEEP ...................................................................................................................................... 11
      2.7.1 Stress and its Effect on Sleep ............................................................................................ 12
      2.7.2 Sleep and Learning ......................................................................................................... 12

3 RELATED WORK AND PRODUCTS ............................................................................................... 12
   3.1 COMMERCIAL PRODUCTS ....................................................................................................... 13
      3.1.1 Headspace ......................................................................................................................... 13
      3.1.2 Aware ................................................................................................................................. 13
   3.2 ACADEMIC RESEARCH AND ARTEFACTS ............................................................................ 13
      3.2.1 Hold my Heart and Breathe with Me: Tangible Somaesthetic Designs .......................... 13
      3.2.2 You Can’t Force Calm: Designing and Evaluating Respiratory Regulating Interfaces for Calming Technology ................................................................. 14
      3.2.3 Peripheral Paced Respiration: Influencing User Physiology during Information Work 15
      3.2.4 IxD Lab ............................................................................................................................. 15

4 METHODS ..................................................................................................................................... 17
   4.1 LITERATURE REVIEW ............................................................................................................. 17
   4.2 USER-CENTRED DESIGN (UCD) .............................................................................................. 17
   4.3 FIELD STUDIES ....................................................................................................................... 17
      4.3.1 Survey ............................................................................................................................... 18
      4.3.2 Interviews .......................................................................................................................... 18
      4.3.3 Focus Group ...................................................................................................................... 19
      4.3.4 Object-Based Techniques ................................................................................................. 19
   4.4 PROTOTYPING ......................................................................................................................... 20
      4.4.1 Low-Fidelity (Lo-Fi) Prototypes ....................................................................................... 20
      4.4.2 High-Fidelity (Hi-Fi) Prototypes ..................................................................................... 21
      4.4.3 Wizard of Oz ...................................................................................................................... 21
4.5 User Tests and Usability Testing ......................................................... 21

5 USER RESEARCH AND RESULTS ................................................................. 21
5.1 Literature Review .................................................................................. 21
5.2 Field Studies ......................................................................................... 22
  5.2.1 Survey ............................................................................................. 22
  5.2.2 Interviews ......................................................................................... 23
  5.2.3 Gathered Findings and Insights from The Survey and The Interviews .... 24
  5.2.4 Workshop ......................................................................................... 25

6 DESIGN PROCESS ...................................................................................... 32
  6.1 Brainstorming ....................................................................................... 32
  6.2 The Design Proposals .......................................................................... 33
    6.2.1 “The Worry Cloud” ................................................................. 33
    6.2.2 “The Breathing Light” ............................................................. 34
    6.2.3 “A Forest Breath” ...................................................................... 36
  6.3 Lo-Fi Prototypes I ................................................................................. 37
  6.4 User Tests I .......................................................................................... 39
    6.4.1 Planning and Execution ............................................................... 39
    6.4.2 Findings ......................................................................................... 40
  6.5 Choosing and Exploring a Design Idea ................................................. 41
    6.5.1 The Act of Writing Down Your Thoughts ..................................... 41
    6.5.2 Planning a Small Test ................................................................. 42
    6.5.3 Findings ......................................................................................... 42
  6.6 Hi-Fi Prototype I .................................................................................... 42
    6.6.1 The Prototype ............................................................................... 43
  6.7 User Tests II .......................................................................................... 45
    6.7.1 Planning and Execution ............................................................... 45
    6.7.2 Findings ......................................................................................... 45
  6.8 Final Design Proposal .......................................................................... 46

7 DISCUSSION ............................................................................................... 47
  7.1 Insights and Value ................................................................................ 47
  7.2 The Design ............................................................................................ 48
  7.3 Critical Evaluation ................................................................................. 49

8 CONCLUSION .............................................................................................. 49

9 REFERENCES .............................................................................................. 50
1 Introduction

During the final weeks of a school term, you often hear the topics of stress and anxiety to be discussed among students. As students are stressed, they tend to end up with a fairly bad sleeping habit. While sleep is something vital, talking with your fellow students about how little sleep you got last night has ended up with a form of bragging vibe to it. It's almost as if it has become a prestige to get as little sleep as possible.

While students stress and stay up all night to study, published reports on stress among university students shows that the stress levels of the mentioned group are increasing year by year. In fact, in just three years it has increased by 9 percent in Sweden (Folkhälsomyndigheten, 2019). What's to be noticed is that stress does have negative effects such as sleep deprivation, headaches, stomach issues and poorer study results (Folkhälsomyndigheten, 2018). One can just assume the vicious circles of, bad sleep, stress and health problems students can end up in. Especially when stress and bad sleep can affect the study results which probably only makes them more stressed.

1.1 Background

In our lives, sleep plays a vital part where it is filled with many valuable functions. Many important functions, all from cognitive abilities such as the ability to learn, memorize and make logical decisions to bodily functions such as immune system and fighting off sickness, are affected by our sleep (Walker, 2018). While sleep is important, it also goes hand in hand with stress where it is easy to end up in a vicious circle of bad sleep and stress (Meerlo, Sgoifo, & Suchecki, 2008).

There is a ton of different techniques, applications, and products to prevent and cope with stress ranging all from meditation to exercise. Yet, not everyone does anything actively to prevent stress in their lives. As the work of an interaction designer is to design interactive products to support the way people communicate with their everyday lives (Preece, Sharp, & Rogers, 2015), it can be applied to the area of aiding the reduction of stress in students lives. By creating user experiences where it is to be considering the different aspects of what makes people happy, sad, calm and so on, we can create design aspects with an artefact to create experiences that help in reducing stress. By understanding and getting to the core of emotions and feelings connected to stress, it provides a way of how to design an artefact that can trigger affect or reflection with the user (Preece et al., 2015).

1.2 Purpose

The purpose of this thesis is to research the problem area of stress among students and get to the core of where, why and how stress is experienced by that
particular target group. With interaction design as an approach to the problem area, the aim is to find a solution or aid to help reduce the stress among students. The focus was on creating an interactive, tangible and embodied approach, different from, for example, just an application on a smartphone. The aim was to bring different theories concerning stress together with insights from user research and bring that knowledge into a tangible artefact. The thesis will look closer on stress and stressors, theories on stress management and tie it together with insights gathered from users and come with a design proposal that could be a help to those suffering from stress.

1.3 Intended Target Group

The intended target group for the research is young persons in the ages of 16-26 since this is the group that has been reported to have some of the highest increasing stress levels (Folkhälsomyndigheten, 2019). Extra focus will be put on university students since reports show on high numbers of students that experience stress together with symptoms of exhaustion, anxiety, depression, and worries of not being able to complete school work. Additionally to for this reason is that the number of persons suffering from stress and mentioned troubles is higher among students than it is among young professionals in the same age group (Folkhälsomyndigheten, 2018).

1.4 Delimitations

The research for this thesis is limited to students at Swedish universities since interviews, workshops and user testing needs to be in person. Additionally, the intended target group is based on the data received from the Public Health Agency of Sweden, which makes it natural to focus on Swedish students.

A limitation for the design process was set with the intention of finding a solution that works in the physical space to get away from classical solutions that are purely digital. Additionally, the cognitive and neurological science of stress will not be deeply research as the focus will be put at research that favours a design work.

1.5 Research Question

*How might a tangible and embodied interaction design reduce the stress levels among students by aiding them communicating with their everyday problems?*

1.6 Ethics

The ethical concerns need to be taken into consideration within this thesis as the data gathered might be personal and sensitive. Getting to the core of stress and stress relief might touch upon personal issues or sensitive facts among the participants which need to be taken into consideration.
The work follows ethical standards with rules and guidelines for research in Humanities and Social sciences formulated by The Swedish Research Council (Vetenskapsrådet, 2017). Participants were always informed about the research project and before participating while their participation was voluntary. They were informed orally or in written form about their rights, how their contributions would be used, and that the participation was anonymously where gathered material would be used for research purpose only. In connection to workshops, interviews and user tests, the participants got to sign a consent form where they had the right to opt out at any time during the research. Participants identities are hidden and fully anonymous. The usage of photos from the research has been approved by concerned participants.

2 Theory

Following, the theories used for this thesis will be presented.

2.1 Interaction Design

Interaction design can be described as designing interactive products with the goal to support the way people communicate with their everyday lives. It can be said as creating user experiences that enhance the way people work, communicate and interact. The scope of interaction design as a theory and method is quite wide where terms can be used to emphasize different aspects of a design, where user interface design, product design, user-centred design, and experience design are examples. The focus though of interaction design is usually concerned with practice, i.e. the design of user experiences. Interaction design is not really ruled by one particular way of doing design, but it is rather more eclectic, promoting the use of different methods, frameworks, and techniques together. Overall, interaction design is concerned with everything from theory, research to practice when it comes to designing user experiences for technologies, products and systems (Preece, Sharp, & Rogers, 2015). It is contextual where its goal is to solve specific problems under a set of circumstances using the available materials. An interaction designer's goal is to design for the possibility of interaction (Saffer, 2009).

2.2 User Experience Design

Central to interaction design is the user experience, where user experience design defines how a product behaves and is used by people. Being more specific, it concerns how people receive and feel about a product and the pleasure and satisfaction while using it. This includes the overall impressions of a whole design, even down to details such as how smoothly a switch rotates or the different sounds of buttons. While discussing user experience design, it
is needed to keep in mind that it is not about designing a user experience, but it’s rather designing for user experience (Preece et al., 2015).

2.3 Emotions and User Experience

While designing for user experiences, the emotions of the users while using a product is a part that needs to be addressed. Emotional interaction concern how we feel and react while interacting with technology, where it covers the different aspects of the user experience. It can also be on looking at why people become emotionally attached to certain products, for example, virtual pets or how social robots can help in the reduction of loneliness (Preece et al., 2015).

Understanding, using and creating emotions and using it for experience design is not a straightforward and easy task to achieve since people's moods and feeling are constantly changing. However, emotional interaction is about considering the different aspects of what makes us happy, sad, calm and so on and use that knowledge to inform the different design aspects of the user experience. By understanding the feelings and emotions of the users, it provides a way of considering how to design a product or interface that can trigger affect or reflection with the user (Preece et al., 2015).

2.4 Tangible and Embodied Interaction

As emotions are evoked, not only by what we see and hear but also what we touch, grasp and feel, tangible and embodied interaction plays a vital part. Tangible computing is usually thought in the way of something being graspable in the physical sense but also believable in the figurative sense. New technologies offer the possibility to explore new forms of properties. As an example, drones could be seen as birds where they give people the opportunity to see what they can’t see. Intimately, tangibility is the form of related to physical sensing capabilities, personal desires, life management, human attitudes, and conceptual credibility (Boy, 2016). The essence of tangible computing is that it allows for a form of computing that manifest in the everyday world. A world that is open for interpretation and exploration which is meaningful in the way that we understand and act in it (Dourish, 2001).

The common way in which we encounter the everyday world, all from the social to the physical reality, is through what we call embodiment. It is the phenomena of which we encounter directly rather than abstractly. As a proponent for tangible computing, the key to its effectiveness is that we and our actions are embodied elements of the everyday world. While embodiment doesn’t necessarily mean physical manifestation, it is rather something grounded in everyday experience. What can be understood of embodiment is that it is about relationships between action and meaning. In the end, embodiment is not about the properties of systems, technologies, or artefacts, it is rather a property of interaction (Dourish, 2001).
2.5 Stress

Stress is something that we all encounter somehow in our lives, though we might describe differently on how we experience it (Fricchione, 2016). How persons experience stress and what it is that triggers it vary in different ways, for example, moments such as encountering frustrating situations or dealing with pressures from internal or external sources such as the expectancies of scoring a good grade on an exam (Sudhir & Taksal, 2013).

The cause for stress is widely understood and defined to be caused by stressors with an outcome of a stress response. A stressor can be any kind of factor that causes a disturbance and can be in both a mental and physical form. The stress response, what we usually refer to as stress, are generally categorized as different kinds of responses. It can be in the form of a physiological response, a behavioral response, an emotional response, and a cognitive response (Rajeswaran & Bennett, 2013). Physiological changes are prompted by hormones released when we are exposed to a stressor. This is usually described as sensations of an increased beating heart, tense muscles and quickening breathing. Scientifically, stress overall involves a series of hormones, the brain and the autonomic nervous system which controls functions such as breathing, blood pressure, and heartbeat (Fricchione, 2016).

In Sweden, the percentage among persons in the ages of 16-29 that indicates that they are stressed are at 26 percent. That means that every fourth person in that age span is stressed. For students specifically, the percentage of how many that express that they are stressed have since 2016 increased by 9 percent (Folkhälsomyndigheten, 2019). Stress and exhaustion have through studies also been shown to cause poorer study results, decreased occupational readiness, decreased engagement and decreased professionality in work environments (Folkhälsomyndigheten, 2018).

2.6 Stress Management

Stress is something that probably never will be fully avoidable. Therefore, the focus may not be fully put on stress elimination but rather focus on stress management. The main challenge is to not let the stress stay chronically aroused (Joshi, 2005).

The spectrum for different stress management techniques is wide and range from breathing exercises to relieve the stress through senses. What may work for some may not work for others. It’s quite hard to find a technique that works universally for everyone. But scientifically some techniques are shown to work, especially if you look into how a certain technique affects the breathing and the heartbeat.

2.6.1 Breathing Techniques

The breath and breathing techniques are known as an extensive way of reducing and coping with stress. Breathing is a bodily function that we can control and
use to help us activate our relaxation response and bring us back to a balance within ourselves. Just a few mindful breaths can calm and quiet a rapid and fearful breath. While it has direct positive effects on our breathing pace, deep breathing practices can also help to get the blood pressure back to normal in the event of stress (Joshi, 2005).

2.6.2 Meditation and Mindfulness

Hand in hand with breathing techniques, meditation and mindfulness show positive effects on stress. By just listening, observing and feeling your own breath it can lead you to a meditative state. The hardest part about mindfulness and meditation is to let the thoughts go away and just focusing on the breath and the world around you. Meditation is proven to be effective where just one or two daily sessions of meditation can change how the body responds to stress. A study conducted at the Medical College of Georgia showed how a daily practice of meditation kept blood vessels open and therefore lowering the blood pressure of meditators significantly compared to persons that only tried to relax as much as possible (Joshi, 2005). Scientists have further discovered the benefits of mindfulness and meditation techniques to not only help to manage the blood pressure but also help manage chronic pain, sleep problems, gastrointestinal difficulties and to relieve stress (Fricchione, 2016).

Apart from breathing, writing can be a powerful meditation and mindfulness practice. Writing can help in the way of loosening attachments and habitual states of mind in order to attend to the present moment and become more aware as a form of meditation. It gives a busy mind something to do where the intention is to unwind the mind (Brunette, 2013). Additionally to the act of writing down your thoughts, the English scientist and professor of neuroscience and psychology Matthew Walker mentions a study where it was found that by having a habit of writing down thoughts and worries before bedtime, people fell asleep faster while also the quality of sleep was improved (Skavlan, 2019). As sleep often is affected by stress, it is an interesting result in relation to how to cope and reduce stress.

2.7 Sleep

Sleep is a vital part of life filled with many valuable functions. Sleep is a rich constellation of benefits both benefits our bodies as well as our mind. Within the brain, a diversity of functions are enriched by sleep. Our ability to learn, memorize and make logical decisions and choices are all affected by our sleep. As well are bodily functions affected and improved by sleep. Restocking the armoury of the immune system, preventing infection, helping fight malignancy and fighting off all manner of sickness are all functions fuelled by sleep (Walker, 2018). With this in mind, getting enough of high quality of sleep is an important part of people’s lives when it comes to overall health where it is important to not let the stress affect the sleep.
2.7.1 Stress and its Effect on Sleep

Stress and insufficient sleep go hand in hand where it’s easy to end up in a vicious circle in which the stress results in bad sleep and the inability to sleep may increase the experience of stress. It is often sleep deprivation is thought of as a stressor where studies have shown activation of the classical stress systems with elevated levels of stress hormones. Stress hormones do not only work in aid for the metabolic process and physical activity acute stress, but it also affects the cognition, mood and brain functions. Therefore, the importance of a good night’s sleep is highly significant where the effects of sleep loss on stress systems may have direct functional consequences on how people deal and perform with everyday challenges. In the long run, sleep deprivation may also affect the reactivity of these systems to other stressors and challenges. With this said, sleep deprivation and stress are in a way, not two different conditions that can be fully separated (Meerlo, Sgoifo, & Suchecki, 2008).

2.7.2 Sleep and Learning

While sleep is important to the overall health, it also has other advantages. At night time, many brain functions are restored and are dependent on a good night’s sleep. One of the many advantages sleep has is on the memory and learning abilities. Sleeping before learning refreshes the possibilities to create memories and thus remember what we learn. A research team conducted a study to look at how sleep affected the memory. It was found that sleep could help in the transfer from the short-term memory storage in the brain to the long-term memory storage. By freeing up short-term memory storage through sleep, the ability for learning is refreshed. In the study, two groups were assembled, where one group took a 90-minute nap in the middle of a rigorous session of learning (one hundred face-name pairs) while the other group instead stayed awake and performed activities such as browsing the internet. Results showed the groups performing on comparable levels where the group that took a nap had a 20 percent learning advantage (Walker, 2018). It is remarkable how even a nap can have such a positive impact on learning and proves how important sleep is for the learning ability. As Walker (2018) mentions in his book, there is no wonder that you’ve never been told to “stay awake on a problem” but you are rather instructed to “sleep on it”.

3 Related Work and Products

In the following chapter, the commercial products available and related research projects within the field that have been used in an informative and inspirational way for the thesis will be presented.
3.1 Commercial Products

3.1.1 Headspace

Headspace is an application with the mission to improve the health and happiness through mindfulness and guided meditations and exercises. Their library consists of exercises on everything from stress and sleep to anxiety. Headspace uses clinically-validated research on their product and are committed to advancing the field of mindfulness meditation (https://www.headspace.com/).

3.1.2 Aware

Aware is a mindfulness meditation application which guides the users through the method of mindfulness to bring awareness of the present moment. The application provides various themes of courses on health, relationship and performance which is open for choosing according to the user's mood and lifestyle and how to apply mindfulness in daily aspects of the user's life. The application also provides short exercises such as simple breathing exercises, sound immersion exercises and power exercises that can be done throughout the day (https://awaremeditationapp.com/).

3.2 Academic Research and Artefacts

3.2.1 Hold my Heart and Breathe with Me: Tangible Somaesthetic Designs

In a paper written by Aslan, Burkhardt, Kraus and André (2016), they present two somaesthetic designs where one design is a stuffed animal with the feature to breathe in synchrony with the user and the other design is a heart which enables the users to feel their own heartbeat. Somaesthetics is an interdisciplinary field and theory where the core is to improve self-awareness through a somatic introspection (Aslan, Burkhardt, Kraus, & André, 2016).
Results from the project highlighted the potential of making behaviours of our bodies tangible and visible for special user groups in the aim to help them establish a trust towards meditation practices. But it also highlighted the somewhat negative aspect where the concern was that artefacts like the ones used in the study might guide the user away too much from their own bodies. But they do point out the benefit it might have for beginners to meditation since inward listening is a demanding activity that could benefit from designs that helps the users directing their attention. Additionally, they argue that situations can benefit from a tangible design where it could be helpful to demonstrate the effect of breathing exercises cycle (Aslan et al., 2016).

3.2.2 You Can’t Force Calm: Designing and Evaluating Respiratory Regulating Interfaces for Calming Technology

In a study conducted by Wongsuphasawat, Gamburg and Moraveji (2012), they evaluated techniques and designed to support a regulated breathing in order to reduce stress. An iPhone app was created which consists of a 1-minute breathing drill where the user is supposed to match the breathing to a guide (auditory or visual) to induce calmness. The visual mode takes the form of a pulsing circle that indicates the diaphragmatic expansion and contraction with the user. The auditory mode is in the form of moving water where the fade-in and fade-out indicate the breath cycle (Wongsuphasawat, Gamburg, & Moraveji, 2012).

Results from the study shows on an increased subjective calm, mostly from the auditory mode rather than the visual one. Discussions concern the possible additional cognitive load that may have been a problem when trying to match a visual stimulus to the respiratory behaviour. In user tests, about half of the
participant closed their eyes while the audio was used to ignore the visual noise. The breath and respiration are usually one that is experienced more aurally than visually, and therefore connecting the breath to an auditory stimulus might feel more natural for the user. With that said, even though the visual guide was expressed as less calming than the auditory one by the users, the results showed that the visual mode led to more change in the breathing range than the auditory one. Conclusions expressed how a decreased breathing rate not necessarily goes hand in hand with a feeling of increased calmness with the users (Wongsuphasawat et al., 2012).

3.2.3 Peripheral Paced Respiration: Influencing User Physiology during Information Work

In a project conducted at the Calming Technology Lab at Stanford University, they present the design and evaluation of respiration pacing methods integrated into the desktop in a peripheral manner. What differs this design to other calming, respiratory method designs are that it does not require the user’s full attention as other techniques usually does. So far, most of the technology-mediated respiratory pacing artefacts have required the user to change their attention from the current task they are doing and put full focus on the artefact and the technique. Instead in this project, the aim was for a solution that enables peripheral paced respiration which would allow users to engage in other tasks and thereby increase its accessibility and frequency (Moraveji et al., 2011).

The design consists of two parts, one sensor attached on an adjustable band to detect exhalation and inhalation, while the user interface consists of three pacing techniques on the screen. The pace respiration is shown through “Screen Dim Feedback” where the entire screen goes from near black to maximum brightness at the target pace, “Menu Dim Feedback” that does the same but on the Mac OS bar and the third “Bounce Feedback” which uses an animated bar to pace the respiration (Moraveji et al., 2011).

Results from experiments where they integrated and tried out their design while participants were working by their laptop showed that the peripheral feedback reduced the breathing rate significantly among the participants, but the changes are though not sustained for the duration of the tasks (Moraveji et al., 2011).

3.2.4 IxD Lab

Interesting projects by students have been done at the IxD Lab at the IT University of Copenhagen where they designed lamp prototypes for tangible, interactive experiences with bodies, code, electronics and materials (“IxD Lab,” 2018). Some of the artefacts are particularly interesting since they have a focus on breathing and mindfulness.
3.2.4.1 *Take a Breath*

Take a Breath is an interactive lamp which encourages the user to take a moment and explore the power and dynamics of their breath. By putting the hands on the lamp when inhaling and removing the hands while exhaling, the lamp will visualize and guide the user through the exhalation by slowly fading (“IxD Lab,” 2018).

![Take a Breath](image)

Figure 3.3. Picture of the Take a Breath interactive lamp. The light increase as the user hold their hands underneath while breathing in (“IxD Lab, 2018”).

3.2.4.2 *GlowSlow*

GlowSlow is a lamp that invites the user to do calm and fluid movements that are rewarded with an increasing light system. It is meant to encourage users to take pauses and being mindful for resting and recharging (“IxD Lab,” 2018).

![GlowSlow](image)

Figure 3.4. Picture showing the GlowSlow lamp (IxD Lab, 2018).
4 Methods

The theory of the methods used during the project will be presented in following chapter. Further, chapter four and five will include how these methods were applied in the project.

4.1 Literature review

Literature reviews is a good method to use in order to become well-informed on a topic by gathering existing data through books, articles, academic texts and official websites. As the literature comes from broad range of theoretical perspectives, the approach of a theoretical literature review provides an analysis of how various theories have framed and examined a particular issue (Muratovski, 2016).

4.2 User-Centred Design (UCD)

The underlying philosophy of user-centred design is that the users know what their needs, goals, and preferences are where it is the designers job find those points and design it for them (Saffer, 2009). The design process of user-centred design is driven by information generated through the design users. It's an intuitive way of finding ways for people to interact with products. Therefore, the participants are the main subjects of study in user-centred design research processes. By using this type of research process, it opens up to the possibility to design engaging and user-friendly products, environments and interfaces (Muratovski, 2016).

First and foremost, UCD (user-centred design) research is human-focused experimental research. In design research such as UCD research, the study can be carried out both in a controlled laboratory but also in the real world where the environment unpredictable and subject to changes affected by external factors. This depends mostly on the purpose of the study whether if prototypes are being tested or final designs are being evaluated. With this, the success of UCD research lie in understanding and involving the end-users in the design process where the users’ needs and desires need to be understood and determined (Muratovski, 2016).

4.3 Field studies

A combination of data gathering techniques has been used since it provides the possibility and benefit of providing multiple perspectives (Preece et al., 2015). The nature of the data that has been gathered has been both quantitative and qualitative. Further in this section, the different methods used during the field studies will be described.
4.3.1 Survey

Surveys are good to use with the purpose to find and document people’s characteristics, attitudes, opinions and experiences towards a chosen topic. Surveys and questionnaires can be used in conjunction with other methods such as interviews to get a clarified and deepened understanding (Preece et al., 2015). Since the core of the outcome of a survey lies in the questions that are asked, the planning and execution of a survey is essential. The main difference from an interview and a survey is that the questions for the survey needs to be formed so that the answers are quantifiable. Although, this does not mean that open-ended questions can’t be used. By using a few open-ended questions, it might provide useful insights or new perspectives to the research area (Muratovski, 2016).

What needs to be taken in consideration while conducting a survey is to be aware that the data collected from a survey is a so-called “self-report” data, which means that people are telling you what they believe are true or what they believe is what you want to hear. It might also be the case that people don’t give enough thought to the issue you are asking them about since people’s opinions are often constructed on the spot. Surveys are at the same time seen as a waste of time by people and with that in mind the survey needs to be kept as short as possible. They should start with questions that raises interest and engagement before moving on to sensitive questions which should be left to the latter part of the survey. Additionally, a follow-up question such as “Can you tell me more about that?” may provide the additional information needed if previous response is vague or difficult to interpret (Muratovski, 2016).

4.3.2 Interviews

Interviews are a good tool to use to find out what people’s opinions, ideas, and attitudes towards a topic are. Interviews can be used both as a primary research method but also in conjunction with other methods as to gather deeper or additional information. Semi-structured interviews in particular are formed in a way that they provide an opportunity for extended response and exploration (Muratovski, 2016). Semi-structured interviews are formed as a mix of both unstructured (open) and structured interviews, where it tends to be topics and subtopics the facilitator uses in the interview. By structuring the interviews this way it gives the facilitator the opportunity to modify the interview and wordings to fit each interview situation and be able to get clarification as the interview goes (Watkins & Gioia, 2015). At the same time, one needs to be aware that the conversation easily could get side-tracked from the topic, which not necessarily needs to be a negative aspect since it may inform about certain issues that you weren’t aware about (Muratovski, 2016).

In order to explore the thoughts, feelings, and experiences of the user the effect of the facilitator’s preconceptions needs to be minimized. Nondirected interviewing is a way of interviewing that does not lead or bias the answers, this minimizing the preconceptions of the facilitator. Leading questions should be
avoided as they inject the prejudices of the facilitator. Questions should be focused on the person being interviewed and focus on experience. It’s easy as a person planning and conducting an interview to idealize and simplify while trying to understand persons behaviour (Kuniavsky, Goodman, & Moed, 2012). Additionally, using probes while interviewing is a useful method for getting more information, especially neutral probes such as “Do you want to tell me anything else?”. As semi-structured interviews are constructed to be broadly replicable, probing and prompting is to aim to help the interview along without it becoming bias (Preece et al., 2015).

4.3.3 Focus Group

Focus groups are structured and moderated group discussions intended to reveal the target audience’s preferences, experiences and stated priorities. Additionally, focus groups are appropriate to use for finding desires, motivations, values and memories (Kuniavsky et al., 2012). The benefit of focus groups is that they allow for a diverse and sensitive issue to be raised that otherwise might be missed or overseen. With the sufficient flexibility of a focus group, a facilitator can follow unanticipated issued as they are raised (Preece et al., 2015).

Focus groups used within the field of user experience design are usually used early on in the product development since that’s when the development team is trying to nail down the problems the product is supposed to solve, together with how and why it’s valuable. Focus groups can in combination with object-based techniques and imaginative techniques such as probes, collages and mapping prompt a concrete discussion about what the users want with products and services. Bringing working prototypes and visual mock-ups can help with getting feedback on what direction to go with a design early on before too much time have been invested on it (Kuniavsky et al., 2012).

4.3.4 Object-Based Techniques

Most user research rely on the talking and listening of the intended users even though there is a lot that the users know and feel that they might have troubles expressing in words. Object-based techniques are a good supplement to what can be learnt from interviewing and observing the users to think with and through added objects. Object based techniques are good to use at an early stage when the goal is to be exploratory and open. Using these exploratory techniques can generate rich and inspirational data about aesthetics, values and people's aspirations. All of the techniques that are object-based usually fit and happens in conjunction with interviews or focus groups (Kuniavsky et al., 2012).

4.3.4.1 Photo Elicitation

Dialogic techniques are a simple way to stimulate a discussion by showing people things such as images and have them respond. The dialogic technique of photo elicitation can be used to prompt a conversation between researchers
and participants. The purpose is not to have the images replacing the words, but to use them to stimulate vivid, meaningful and concrete words. In photo elicitation, researchers show a set of images and have the participants to respond to them. As the participants discuss the images, researchers can begin to understand what the participants see in them and apply the interpretations to the project (Kuniavsky et al., 2012).

4.3.4.2 Collage

Through generative techniques, participants can externalize emotions and thoughts by expressing them through the creation of objects. The generative technique with collage and mapping invites participants to be able to represent their internal thoughts and feelings. In the creation of a collage, individuals or a group can make new compositions out of a pre-existing set of elements provided. Not only are they easy and fun to do, but they also useful for expressing attitudes, desires and emotions. The goal of a collage is, as said, to help the participants to express their emotions and thoughts by first making the collage followed by a conversation about the collage (Kuniavsky et al., 2012).

4.4 Prototyping

To be able to evaluate a design of an interactive artefact effectively with the users, prototypes of the ideas needs to be created. This can be done both in early stages of a development where the prototypes usually are easy ones pulled together to allow evaluation while as later on in a design process, they tend to become more polished as to resemble the final product. Simply, a prototype is a manifestation of a design that allows for interaction to explore its suitability. In the end, a prototype can be anything from a paper-based storyboard to a complex piece of software as long as it allows for a discussion, reflection or evaluation of design ideas (Preece et al., 2015).

By the nature of prototypes themselves, they do involve compromises. The intention of creating prototypes is to be able to produce something quickly in order to test an aspect of a product. Not to mention the kind of questions that a prototype can answer is limited to how its build, which means that it needs to be built with key issues in mind (Preece et al., 2015).

4.4.1 Low-Fidelity (Lo-Fi) Prototypes

A low-fidelity prototype does not necessarily look very much as the final product and does not provide the same functionality. However, they are useful since they tend to be cheap, simple and quick to produce which means that they at the same time support the exploration of alternative designs and ideas. The main purpose of a low-fidelity prototype is to open up for exploration, which is important in early stages of a development (Preece et al., 2015).
4.4.2 High-Fidelity (Hi-Fi) Prototypes

Opposite from a low-fidelity prototype, a high-fidelity prototype looks more like the final product and/or provides a higher functionality. It suitable to use high-fidelity prototypes at stages when technical issues are suitable to test. They can be developed by integrating and modifying existing components, both for hardware and software (Preece et al., 2015).

4.4.3 Wizard of Oz

A method that is commonly used while creating low-fidelity prototypes are the method called Wizard of Oz. The method offers the users to interact with intended design of a software as though interacting with the product. However, the functionality of the prototype is simulated by a human operator as a simulation of the software’s response to the user (Preece et al., 2015).

4.5 User Tests and Usability Testing

Often the term usability testing is used indiscriminately as to refer to any technique that is used to evaluate a product or system. Tests can be done in different stages of a development, where the way to conduct them can range from true classical experiments with large samples to informal qualitative studies with only one single participant. In this thesis, usability testing and user tests is referred to a process involving testing participants from the target audience to evaluate to which degree a product meets the usability criteria. Through iterative design and testing approaches, it allows to make steady and rapid progress on projects and gives the ability to “shape” the product to fit the end users’ abilities, expectations and aptitude (Rubin & Chisnell, 2008). The guidelines and rules used for testing a design is similar to the ones for design research: simplified you go to the users; you talk to them and you write things down. Testing is also the time where any wrong conclusions taken during the design research can be found and corrected. Misinterpretations or wrong implications of the research can be found through user testing and clear those up (Saffer, 2009).

5 User Research and Results

5.1 Literature Review

Literature reviews have been used in the early stages of the project in order to get an understanding of the research topic. With gathered knowledge in this phase, the goal was to use that to appropriately plan further research to be able to get the most valuable data.
The gathered knowledge has been described in chapter two as theories, where valuable insights have been found on stress, sleep, stress management, and related works. The gathered insights from the literature review gave a good understanding of the topic as a whole. In order to get deepened and clearer knowledge concerning the intended target group, the knowledge gathered through the literature review was used as a foundation for further field studies and design work.

5.2 Field Studies

Field studies were conducted in order to get a better understanding of people’s problems when it comes to stress, their mindset on the subject and how they try, or don’t try, to reduce the stress in their lives. The literature review provided a good understanding of the topic. However, to get a deeper understanding of the target group and their thoughts and needs, field studies were conducted. The field study consisted of a survey, interviews and a workshop. Further, an explanation of how each method was conducted and the insights and data gathered will be provided.

5.2.1 Survey

5.2.1.1 Structure of the Survey

The main purpose of the survey was to gain insights on when and where stress is experienced, what the target group might do to reduce or prevent stress and how the stress affects their lives. While conducting a survey, the interest of people participating can easily be lost by having a too long survey while also requiring extensive answers (Muratovski, 2016). With this in mind, the survey was formed to be short without too extensive questions throughout the survey. Many “yes” or “no” question was used, however, a few open-ended questions were used as it might provide deeper insights or new perspectives on the subject (Muratovski, 2016). The survey was shared to fellow students but also online on different student forums and student groups on Facebook in order to reach as many as possible.

5.2.1.2 Results

Out of 68 answers to the survey, 53 claimed that they experience stress while only 40 claimed that they suffer from stress. Most of the answers also stated that it’s at certain times and situations that they feel stressed. Recurring answers was that students experience stress during group projects, before exams and when there is a lack of information. When it comes to places, it was mostly stated to be at home most stress was experienced, not in school. One participant stated in the survey on the question regarding when they are feeling stressed, “All the time because of the fact that you can’t be “done” with studying ever...”. This is an example that highlights the stress students experience compared to stress among persons with a somewhat normal day job. Usually, they can leave the workplace and leave all the work at work where students on
the other hand never really are “off school” since homework, assignments, and projects also need to be done at home. You can say that a student never really is done studying. You can always study a bit more before that final exam or revisit an essay one more time, which can be the cause of increasing stress. It is easy to end up never feeling “done” with studying.

5.2.2 Interviews

While the survey resulted in interesting and valuable data, the data was rather general than specific and gave a general understanding of the users rather than deep insights. In order to find out more about people’s opinions, ideas, and attitudes towards the topic, semi-structured interviews were conducted.

5.2.2.1 Structure of the Interviews

The usage of semi-structured interviews was chosen since they provide an opportunity for extended response and exploration (Muratovski, 2016). The purpose of the interviews was to investigate further on when and where people are feeling stressed and to dig deeper into why they experience stress at those certain times. The survey gave a good basic understanding of the reasons for stress among students, but it didn’t give much knowledge of how it’s experienced and what students might do to prevent or reduce the stress. The interviews were divided into four parts, where the first part was to get to know the participants with basic and easy questions about for example age and living situation. The purpose of the first part was also to give the participants a calm and comfortable start to the interview while also gaining their interest in the topic. The second part consisted of deeper questions about stress with the participant, trying to get further insights in addition to the survey on what causes stress and where it is experienced the most. The third part consisted of deeper questions, with questions on the effects of stress both physically and mentally but also how it might affect the everyday life and social life of the participant. The fourth part consisted of questions on stress management and different techniques, such as questions regarding whether the participants actively use it or not together with how and why. All the questions were formed to be to avoid the answers to be leading or biased (Kuniavsky et al., 2012).

5.2.2.2 Results

Results from the interviews showed that all of the participants experience a lot of stress when they feel that they don’t have control over a situation or when a situation comes up all of a sudden. Specific situations mentioned was for example when the goals for an assignment are vague or unspecific and when the expected work and outcome from the students themselves is unclear. More control would lead to reduced stress. Additionally, factors such as high expectations on themselves and own set goals were mentioned by one participant as a stress factor. What all the participants further had in common was where they experience the most stressed, which was in the home environment, where at the bed before bedtime was mentioned. Opposite of
initial assumptions where the most stress is experienced while doing school work in school, participants mentioned it as less stress while studying since, as they described it, school feels like a productive environment. Further, they mentioned that even though they might not study that hard when they are there, it feels good to be in such an environment that makes them feel productive.

Two out of three participants actively use some kind of stress management technique. Techniques mentioned were breathing exercises, mindfulness, meditation, and yoga. A lot of the techniques used seemed to be used as preventing rather than managing the stress when it’s experienced. One participant mentioned that he had his mindset on leaving the house for yoga, both because yoga itself worked but also to get out of the home environment and not get stuck there with his thoughts and worries, which would only make him more stressed. While a reason mentioned for not using any stress management techniques or mindfulness techniques was simply because that person had a disbelief in it, while at the same time that person hadn’t tried anything out and given it a chance.

5.2.3 Gathered Findings and Insights from The Survey and The Interviews

To gather and organize the data both from the survey and the interviews, an affinity diagram was structured. The goal was to organize the data to groups and themes in order to see possible connections and relationships between the collected data (Arvola, 2014). Recurring themes and problems could be identified concerning the different causes of stress, how it is experienced, where it is experienced and what techniques and tricks used to prevent and cope with the stress. Some of these insights are already mentioned previously under results for each method.

What’s interesting is that both the survey and interviews showed common touch points regarding where the students feel the most stressed, which seems to be at home or in environments experienced as unproductive. But what stress seems to be induced by mostly are worries connected to a lack of control. Factors such as uncertain deadlines, goals and expectations, lack of communication both between students and teachers but also between students themselves in group projects, and a lack of information were all recurring problems that students expressed as stress triggers. Comments that all are in some way connected to a lack of control of situations. One particular comment from a survey participant was “When a lot of things happen that I feel that I have no control over” as a reason for feeling stressed.

Answers regarding how stress is experienced and appeared are recurring and similar among the participants both in the survey and the interviews while it is similar to how stress is described in the theory. Mainly it seems like a lot of
students experience a racing heart but also an increasing and more shallow breathing. Recurring answers showed that stress extensively affects their sleep, that stress results in stomach issues while it also results in an increased irritability and concentration difficulties. Concentration difficulties might lead to less effectiveness in school work, which possibly might lead to increased worries and experienced stress for the student which leads to sleeping problems which itself can lead to decreased ability to cope with everyday stressors. A vicious circle student easily can end up in.

Recurring themes and techniques could also be found when it comes to coping and preventing stress. Main techniques mentioned to be used were diet and exercise, both for coping and preventing stress, but it’s also a technique that is used to improve the overall health of the students so the main reason of doing wasn’t necessarily purely stress related. Techniques that on the other hand were mentioned to be used directly for preventing and coping with stress were breathing techniques, meditation, and mindfulness. Techniques that usually goes hand in hand with each other since meditation and mindfulness often includes breathing techniques. Techniques that the theory in chapter two proves to be effective in reducing and preventing stress. Another technique mentioned was time management and creating boundaries for oneself. This can be connected to how stress seems to be induced by the lack of control where time management might be a way of creating some kind of increased control of situations.

5.2.4 Workshop

As the survey and interviews provided valuable data, a workshop was chosen to be used in addition with the goal of exploring the design aspects of stress and particularly what forms, materials, sounds, aesthetics, experiences, and emotions that are connected to stress as well to calming down and reducing stress.

5.2.4.1 Planning and Structuring the Workshop

Based on the data from the survey and the interviews, a workshop was prepared combined with the method of focus groups. The purpose of the workshop was to dig deeper into specifically where and when stress is experienced in order to find a design space where a possibly calming artefact that could be introduced. The purpose of the workshop was additionally to explore what different forms a calming artefact could take on, such as aesthetics and the experienced feeling. Since theory have shown how breathing techniques, mindfulness, and meditation have positive effects on stress and data from the survey and interviews showed that it is already common techniques that are used, part of the focus for the workshop was then to explore how the theory of mindfulness and breathing could be applied for a calming design. Therefore, the forms or elements that could represent breath or induce calmness was also intended to be explored.
The expected outcome of the workshop was to find elements and directions a design could take and what the main purpose could be. Questions prior to the workshop included if the design should be formed to be stress preventing or if it should be something that can be used while stress occurs and possibly be able to be used at the same time as other tasks. With this in mind, the workshop was to be exploratory which can bring out general attitudes on a given topic, which further can help in the development of a product in terms of criteria and understanding of a product (Kuniavsky et al., 2012).

The workshop was planned in the form similar to a focus group since it is a good technique to use to find desires, motivations, values, and memories. Additionally, it was chosen since it’s good to use early in a design product development, especially for user experience design (Kuniavsky et al., 2012). The workshop was combined with other methods as well where the usage of each method will following be described under each part of the workshop. The methods used were not followed strictly but was changed to suit for this intended reason and used mainly as guidelines. The workshop was divided into three parts, with additionally an introduction to the area of research at the beginning of the workshop. It was conducted with four participants where two of the participants had participated in previous interviews.

Following, each part of the workshop will be explained in more detail of how it was planned and conducted.

**Part 1**

The first part was created to prompt a discussion on where stress is experienced the most. Through interviews and the survey, the home environment had been already been found as the place where the most stress is experienced. Even though with this knowledge, the first exercise was for the participants to do a photo elicitation, rating places from where the most stress is experienced to where it is least experienced. Following, the participants got to discuss why they rated the photos as they did. The purpose of the first part of the workshop was to set the scene while also getting the participants in the right mindset. Additionally, even with the insight on environments connected to experienced stress, the task was also done with the purpose to explore deeper into that area to possibly get further information on feelings and emotions connected to those specific places and why it can be experienced as stressful.

**Part 2**

For the second part, the participants were given the task to do another photo elicitation or collage but this time with elements that could represent either a visualized breath or induce an overall calmness. As a warmup exercises for this, the participants were asked to draw whatever that first popped up in their mind on how breath could be visualized. While creating the collage, the participants were asked to think out loud and discuss the elements with their thoughts and decisions. The expected outcome of this part was to find what the participants
believe induce the most calmness and what elements that could be used for visualizing the breath.

**Part 3**

For the third and final part of the workshop, a form of photo elicitation was planned but implemented with objects and materials instead of photos. Objects such as a light bulb, a light bulb connected to a dimmer, white fabric, wool, balloons, and a speaker were brought to the workshop. The intended use of these materials was to discuss and explore how breath could be visualized, either by one of them in some way or by combining different objects and materials while also discussing how calming the materials themselves could be.

5.2.4.2  *Outcome and Findings*

As mentioned, through the interviews and the survey, the home environment was discovered as the environment where the most stress is experienced where participants rated the bed and living room as the highest (Figure 5.1). The school environment had also previously been found as an environment with a productive feeling to it which led till not as high experienced stress. These are insights that got confirmed in the workshop where it was circumstances all the participants in the workshop agreed on, mentioning that school made them more productive and therefore not as stressful as the home environment. The stress they experience in school was in a way good since there they are productive and actively do the school work.
With the insight that the home environment was more stressful, one could assume that it is while doing school work at home the most stress would be experienced. What was discovered through the workshop was that stress was more experienced and more invasive while trying to relax and not doing school work, where situations as while watching TV or lying in bed trying to sleep were mentioned. As the participants discussed in the workshop, it is when you put down the computer you feel the stress creeping up on you. Additionally, the sofa and the bed were the two places in the home environment where they felt the most stress. It is at these places when they have put down your computer and school books, they had time to think and reflect over what school work they had done or not done and reflect on whether they are doing a good job. What needs to be noted, it is mostly at bedtime the most stress is experienced rather when they wake up since at bedtime it is easy to think and reflect about the past day.
Especially if the student hadn’t had time to do all the work as planned for the day, which leads to increased stress.

During the second part of the workshop where the task was to create a form of collage (Figure 5.2) with photos and elements that could represent breath or induce calmness it was found that when it comes to environments that induce calmness, the sounds and smells were the prior elements that were connected to a sense of calm. As for the ocean, it was the sound of the waves. While as for the forest, it was the sound of the wind and the smell of the trees. Having an overall calm environment seemed like the main factor to the sense of calm, where if it was a home environment such as a bedroom, the lighting of the environment had the biggest impact on how calm the environment would feel. While discussing forms and shapes, it was mostly soft and rounded shapes that the participants connected to breath and calmness, as had been expected.
Figure 5.2. Collage in the making. Different forms and pictures of environments and elements was given to create a collage with while discussing and think aloud about their decisions.
During the last part of the workshop, the object that brought the most interest among the participants was the light bulb with a dimmer (Figure 5.4). The outcome of this task ended up with the participants mainly discussing how each object might induce calmness and less focus on the breath. The discussion concerning the light bulb had, for the most part, a focus on how the overall environment was affected and how that provided a form of calmness. A key insight to be drawn from this together with the previous discussions is that the environment the person is within seems to play the most vital part in perceived stress.

Discussions touched on how the light could be used in a peripheral manner and thus not requiring the full attention from a user where it was further discussed how in the peripheral view, light could help in forming a calmer breathing rhythm without it being too invasive. But overall, the discussions about the light had a focus on how light is an effective and powerful way to induce calmness in either way it's used.
6 Design Process

In the following chapter, the process of coming up with a final design proposal to the research question will be presented. The process will draw back on knowledge, insights and findings gathered through the theories and user research and how it helped in the decision makings in the design process.

6.1 Brainstorming

With gathered findings and insights from the literature review together with the data and insights gathered from the user research phase, a brainstorming session was conducted where questions and certain touchpoints were set as delimitations as well as guidelines (Arvola, 2014). The two main theme questions that were set as guidelines for the brainstorming session was “How might I visualize the breath” and “How might I help in winding down before bedtime with a tangible approach”. Within those questions, delimitations were set where the focus was to solve these questions through light, sounds or materials as these were expressed by participants in the workshop to induce calmness.

The question “How might I visualize the breath” for the brainstorming session was chosen based on the insights from the survey and interviews where breathing exercises and meditation were recurring methods already used by participants. The theory on what kinds of methods that scientifically have been proven to work as calming, both as experienced calm but also physiological positive effects, showed that breathing exercises were very successful. The goal was to find a solution where the methods of breathing could be used and
designed through a tangible and embodied solution and that way be more inviting and interactive.

Regarding the question “How might I help in winding down before bedtime with a tangible approach” was based on the insight that stress was mostly experienced in bed right before bedtime as it’s where they start to think and worry. As one could have assumed regarding students and stress, it is easy to think that it’s in situations where they are doing school work or are in school that they would be the most stressed. But an important insight from the user research was the fact that it’s in the home environment and right before bedtime the most stress is experienced. Environments which should be where you are the calmest and at peace. In addition, participants throughout the user research have expressed how stress affects their sleep. This is an important finding where the theory in chapter two describes the vital importance sleep has and not to mention how important sleep is for us to be able to cope with stress. With this in mind, the goal was to find a solution that could help with winding down with an aim for both sleep better and reduced stress.

6.2 The Design Proposals

Through the brainstorming, three different ideas were developed with different approaches to the research question where decisions were based on findings and insights from the user research phase. Following, each idea will be presented, connected to the knowledge the design decisions were based on.

6.2.1 “The Worry Cloud”

The Worry Cloud would be your own little worry cloud that you pick up before bedtime and tell all your thoughts and worries to. As mentioned in chapter two regarding the theory of meditation and mindfulness, research has proven that the habit of writing down your worries on a paper an hour before bedtime helps you fall asleep faster while it also improves the quality of sleep (Skavlan, 2019). In the user research, it was found that sleeping problems are common among stressed students. It was specifically expressed by several participants that the most stress was usually experience in bed right before falling asleep. It was described to be the place where they think and worry a lot which made them stressed. Having the theory in mind, it opens up the possibility to find a design solution that might combine the positive effects of getting all your worries out on paper together with a calming attribute to it in a tangible approach. The goal of this idea, in early stages, was to explore how the technique of writing out our worries could be done in a more interactive, encouraging and invigorating manner than just writing it on a piece of paper to help students with their stress connected to their sleeping problems.

The idea for The Worry Cloud is that the user whispers their worries to a soft and squishy cloud right before bedtime (Figure 6.1). As the user whisper to the cloud, it slowly glows brighter and brighter in a soft and calm light as it is filled up with the user’s worries. In a way, it absorbs the user’s worries, thus creating
their own little worry cloud. When the user has told the cloud all of their worries, with the cloud being lit up as it contains all of their worries, they can put the cloud away and that way also put all of their worries away.

Figure 6.1. Early sketch for The Worry Cloud that was produced during the brainstorming.

The decisions to use the form of a cloud for the artefact is based on how metaphors are usually seen within the field of mindfulness. The usage of metaphors can be a powerful way to grasp the concept of mindfulness. Clouds as a metaphor are recurring since it often is in the nature that people feel a greater sense of peace (Edmunds, 2015), as insights from the workshop confirm. As it is both calming in a sense of being from the nature, clouds are also a beautiful way of visualizing the internal experiences such as emotions, thoughts, and feelings (Edmunds, 2015).

Findings through the workshop brought up how lights and lightning is a powerful and useful way to induce calmness. For this idea, the way the light is used is supposed to give some kind of calmness at the same time as it is used as an indication of the user filling up the cloud with their worries. The light is supposed to visualize the user's worries to give them the feeling that they are putting their worries away, and through that help them fall asleep easier and improve the quality of sleep. Instead of writing down their worries, they whisper them while the light and the soft and squishy cloud helps further to induce calmness.

6.2.2 “The Breathing Light”

*The Breathing Light* is a light that would sit next to the user’s bed with the purpose to help them pace a calmer breath and that way help them fall asleep easier. The literature review has shown the positive effects breathing
techniques have on reducing stress and also in preventing it together with an increased ability to cope with future stress. Breathing is a function we can control and actively use to help us activate our relaxation response and bring us back to a balance (Joshi, 2005). While breathing doesn’t only help in the reduction of stress, it is also useful in meditation for sleep in guided meditations from for example Headspace (https://www.headspace.com/) where breathing exercises is a part of the meditation. With this in mind, the idea was to bring the act of breathing to a sleeping aid, similar to mentioned guided sleep meditations available that usually uses sounds and person talking and guiding you to a calm breathing pace, but instead with a tangible and embodied approach. It explores if peripheral lightning can be used in that manner instead of sounds as guidance. As motivation for using the light in the peripheral view which doesn’t actively demand the attention of the user is based on the interviews and the workshop where participants expressed the desire of such a product where they don’t need to pay full attention to it. As for *The Worry Cloud* idea, the reason for using light as a calming factor for *The Breathing Light* idea is based on the results from the user research and findings from the workshop concerning the usage of light and its ability to induce a kind of calmness among the users.

To explain the idea, *The Breathing Light* is a light that the user turns on when a sleep aid is needed to fall asleep (Figure 6.2). The light will increase and decrease in the pace of the breath in a calming breathing exercise. The idea is that the user would pace their breathing rhythm to the light without needing to give it too much attention. By using light, it could also possibly be “seen” a bit even with their eyes closed, since you can perceive some light through the closed eyelids. That way the user could breathe with the light while closing their eyes, trying to fall asleep.
6.2.3 “A Forest Breath”

The idea for The Forest Breath is a design where the main idea is that through pressing or touching something similar to a stress ball in the pace of their breath, the sounds of winds in the forest would come and go in the pace that the user is breathing. The sounds of winds in the forest will increase as the user inhales while squeezing the object and decrease when the user exhales and releases the object. In the workshop during the user research, nature was mentioned as an environment where the participants felt calm and relaxed and could unwind from all the stress. An important factor in the environment that made it so relaxing was the sun and the sounds. As the forest was mentioned, the sounds of the winds were mentioned where this design is supposed to bring that calming sound effect and connect it to a calm breath.

The purpose and goal with this design are to visualize the breath and thus make the user more aware. Mentioned several times, the breath has many direct positive effects on our bodies and especially in reducing stress. The method of visualizing the breath as previously been done in several ways in different projects. As described in chapter three, projects such as Take a Breath (see 3.2.4.1) and GlowSlow (see 3.2.4.2) both use light in a way of visualizing the breath where the project Hold My Heart and Breath With Me (see 3.2.1) are visualizing the breath through a stuffed animal breathing in synchrony with the user. Rather than working with something visual, the goal was to explore how it could be done through sounds. It is also supported by the project You Can’t Force Calm, also previously mentioned in chapter three, where participants in that studied expressed connecting their breath to an auditory led to the increased feeling of calmness.
As mentioned, the idea is to visualize the breath but through sounds rather than through something visual. Like previous ideas, this idea is based on the theory of meditation and mindfulness together with the results from the workshop and interviews.

![Figure 6.3. Early sketch that the idea for The Forest Breath was based on. Here exploring how squeezing something in the breathing rhythm and some way get feedback as to visualize the breath.](image)

### 6.3 Lo-Fi Prototypes I

Quick and dirty, lo-fi prototypes were created for each idea to be able to quickly try out and explore the ideas with the intended user group. A short explanation of each prototype will further be given.

#### 6.3.1.1 The Worry Cloud

To try out the idea for The Worry Cloud, a lightbulb was covered by a white, soft fabric filled with cotton to create a soft feeling (Figure 6.4). The lightbulb was connected to a dimmer to control the increasing of the light smoothly while the user talks to the cloud. By using the method of Wizard of Oz, the light could be controlled to give the illusion of the cloud being filled up while the user was talking to it.
Figure 6.4 The Lo-Fi prototype for the design of The Worry Cloud. A lightbulb in the middle is connected to a dimmer with cotton surrounded by white fabric covers the lightbulb to give a smoother and calmer light.

6.3.1.2 The Breathing Light

A very simple prototype was used to try out the idea for The Breathing Light (Figure 6.5). It was simply done by using a lightbulb connected to a dimmer and through Wizard of Oz control the light manually in the intended breathing pace. The important aspect was to explore how the light was perceived and therefore not much time was put on the actual looks of the prototype.
6.3.1.3 A Forest Breath

To prototype the idea for The Forest Breath, the method of Wizard of Oz was once again used. The prototype was put together with a balloon filled with rice to resemble the stress ball that was supposed to be squeezed. When the ball was squeezed, the moderator of the test raises the volume of wind sounds in the forest on a computer that’s put on the side of the participant and lowers the volume as the participant releases the grip of the ball. This is to resemble and simulate the visualization of the user’s breath.

6.4 User Tests I

The first user test was done with the intention to explore the potentials for further progress of each idea, in addition, to test if any wrongful conclusion had been made during the user research. By iterating and doing tests, it allows for a rapid progress of the project and the possibility to shape the design to fit the users’ needs (Rubin & Chisnell, 2008).

6.4.1 Planning and Execution

The first user test was done with two users that previously had been interviewed and participated in the workshop. As users, they are on two different poles of the user spectrum so to say where one participant is often stressed but doesn’t use any kind of technique to wind down compared to the other participant that actively perform meditation and mindfulness exercises with less experienced stress in the daily life. The goal of the user tests was to quickly test the different
ideas to see which one that was received most positively by the users and which idea that possibly had the most potential to proceed with.

The test was carried out in the way that the users got to explore the ideas freely followed by a semi-structured interview. Since all of the ideas have an end goal of reduced stress by winding down, questions focused on the material, feeling and overall experience of the prototypes at the moment they were used. As a limitation at this point, to really understand which design that actually would help to reduce stress overall in the student’s daily life, longer and more detailed testing with refined prototypes would have to be made over a time span of several weeks or even months. Therefore, the focus was on how the stress at the moment was affected instead.

6.4.2 Findings

The Breathing Light got comments such as it would be hard to use for the intended purpose since you might have to lie down in a specific way or direction to “see” the light with your eyes closed. This was seen as a point of irritation from the users since they would probably only be annoyed by it and not get calmer but rather the opposite. Both participants also mentioned that the idea felt a bit “off” and couldn’t really connect the light to their breath as bodily and sensory. While discussing the design a participant instead compared it to sounds that are used in already existing products with a similar purpose which was motivated as more positive. As previously mentioned, sounds and spoken guidance are often used for techniques to wind down, which also makes it easier to close your eyes while doing the breathing exercise especially if the intention is to fall asleep.

In light of the previous comments from the participants, the idea for A Forest Breath got positive feedback as it could be used while lying down with closed eyes. They thought it was interesting to use the sound of winds in the forest as a way to visualize their breath as the winds also could be connected metaphorically to their breath. As one participant mentioned, it is almost like blowing with your own breath through the trees. The interaction of squeezing something as they breathe was mentioned to not feel weird or off-putting, while emphasis needs to be put on the material and form of it where comments concerned that it should be something soft. Something familiar to a stress ball or squeezing a small pillow. A visualization of the breath rather than being guided to follow a certain rhythm was found to be preferred as it is something that can be controlled. For someone that is not used to breathing techniques, it could be invasive and hard to get into it where it also was mentioned that it could give them a “choking feeling” instead of helping them to induce calmness.

The Worry Cloud was positively received by the participants. The interaction of talking to the cloud didn’t feel weird for the participants, though they expressed that they would have felt more comfortable talking to the cloud if they were alone. This is rather a point that needs to be kept in mind for future testing of this particular design where more valuable insights might be found if
that part of the test would have been executed differently. This can be kept in mind where, for coming tests, the participants possibly should try it out alone first followed by interview questions. When it comes to the material and how it feels to actually hold the cloud, the participants liked the fact that it was as soft and squishy as a pillow. A comment pointed out that just by having it soft as helped them feel calmer. The way the light was shining through the soft material was also pointed out as particularly calming. One question specifically concerned if the participants understood the metaphor of a worry cloud and if they could see how the cloud was “filled” with their thoughts and worries as they spoke to it. The participants didn’t have any problem with understanding and seeing that implication with the design since they thought the light worked well as an indicator to fulfil that intended purpose.

6.5 Choosing and Exploring a Design Idea

Through the first user tests, what was found as the most potential design with the broadest space for further exploration was the design of The Worry Cloud which focuses on mindfulness and winding down. The design of The Forest Breath which has a purpose of visualizing the breath to wind down and meditate also got positive feedback and found potential as an idea. But with the time restraints and the motivation and desire to put all of the time and energy to explore one design and all the possibilities within that design space, only the design of The Worry Cloud was chosen to continue working with.

Further motivation for choosing to further explore The Worry Cloud was that the design space for that idea seemed like the widest where a lot of questions and wonders could be asked and explored. With consideration and in comparison, the design space of The Forest Breath isn’t as broad for the purpose of exploring and trying out different iterations. What could have been explored within that design is how the so-called stress ball could be formed and what material to use or explore different sounds. The actual interaction is somewhat simple and not open for further and deeper exploration in connection to interaction design, while with the cloud, both the initial idea of talking out your thoughts as mindfulness practice for the design could be explored while also the materials and forms the design could have is open for wider exploration.

6.5.1 The Act of Writing Down Your Thoughts

The idea for The Worry Cloud is based on the mindfulness practice of writing down your thoughts as described in chapter two. One question that could be raised concerning the activity of getting your thoughts and worries out of your head is what should happen with that information, if something even should happen with it. The initial idea for the design was that the cloud would be filled up with the thoughts and worries of the user without any further interaction. But value can be in asking and exploring if anything else should happen with that information and how it actually feels for the users to get all of their
thoughts out. This is something that easily can be tested on its own without having to use the cloud for that purpose since the main goal of that exploration would be to find possible insights on how the information could or should be handled and used. There is a possible design space there that shouldn't be missed.

6.5.2 Planning a Small Test

With the question mentioned in mind, a simple test was made where participants got the task to write down all of their thoughts and worries on a piece of paper before bedtime for a few nights in a row. That was the only instructions given to the participants in order to keep it open to interpretation and not lead them too much. The test was followed up with structured questions mainly concerning what they wrote down, what they felt doing the task, and their feeling towards their written thoughts.

Three participants were asked to do the task, where two previously had been involved in the project in either an interview or workshop while the third participant hadn’t been involved at all. Expectations for the third person that hadn’t been involved at all previously and didn’t know any details about the project as a whole was that the participant possibly could give a new perspective on the topic as the two others might have the project in mind while doing the task.

6.5.3 Findings

The main topic the participants wrote about while writing down was their thoughts and worries considering school, yet their general life and social life coupled with uncertainty were also brought up but not as much. None of the participants read through what they had written down, neither in the evening nor in the morning the day after. A reason for this mention was the fact that it felt good to get the thoughts out of the head into the physical world in a way and be able to put it away and not have to think about it further, especially before going to bed since then there was a feeling of going to bed with a clear mind. As soon as the participants had finished writing, they didn't feel the need to see that information but rather the opposite, it was perceived as a good feeling to not having to read the thoughts again.

6.6 Hi-Fi Prototype I

A hi-fi prototype was developed in order to test the idea for the cloud even further but in a more natural way for its intended use where the method of Wizard of Oz wouldn’t need to be used. Especially with consideration to the finding from the first user test where it was found that it would be better to create a prototype the participants could try out themselves alone in a room without the presence of the facilitator to get the most accurate and genuine feeling to the design.
6.6.1 The Prototype

The prototype was created with the use on an Arduino board with connected LED-lights (Figure 6.6 & Figure 6.7). The cloud is controlled with two hidden buttons, one to hold when talking to the cloud and one to press when the user feels that they are done talking to it. While pressing the button while talking, the LED-lights lights up one by one, each after a couple of seconds to give the illusion of the cloud being filled up. The other button which is to be pressed when the user feels that they are done turns all of the LED-lights completely off. Figure 6.9 and Figure 6.8 shows the looks of the final prototype.

[Image of the prototype]

Figure 6.6. The inside of the prototype. LED-lights are connected to an Arduino board and is controlled by a green start button and a red start button. It can all be connected to a power bank seen to the right of the Arduino board to make the prototype wireless.

[Image of the LED-lights turned on]

Figure 6.7. Image showing how the LED-lights looks like turned on. These are supposed to be inside a soft cloud to give indications of filling up the cloud with thoughts.
Figure 6.8. Picture showing how the hi-fi prototype looks when the lights are turned on. This is how the prototype looks to indicate the cloud being filled with thoughts.

Figure 6.9. Picture showing the outside looks of the final hi-fi prototype when the lights are turned off.
6.7 User Tests II

The purpose of round two of user tests with the hi-fi prototype was to further explore the different interactions connected to the material and forms. It was also meant to further explore how the users would experience talking to an object instead of writing the thoughts and worries down on a piece of paper. A lot of focus was put on how the materials could be used to give a calm feeling and aid the practice of mindfulness.

6.7.1 Planning and Execution

The tests were carried out with two participants where each participant got to have the prototype at home for two nights to use it in the intended environment and situation. The test was followed by a semi-structured interview to discuss how the prototype was received.

Some questions were set prior to the testing, which was also kept in mind while creating the prototype. Questions that were sought to be answered was:

- How do the buttons feel? Should there even be buttons?
- What experience and approach for the cloud does it give by having a “start button”?
- What experience and emotions are evoked by pressing the “stop button” and the cloud gets dark? What indication does that give the users about their worries and thoughts that are “in” the cloud?
- In what ways can an indication of “getting rid” of the thoughts be given?
- What other interactions as to “start and stop” the activity to speak to the cloud could be suitable instead of buttons?

As expressed in the first user test, concerns were raised towards how the user should know how to start the activity with the artefact and how to finish it. Additionally, what would happen when they are done with the activity? In the first iteration with the lo-fi prototype, the light remained lit when the participants felt that they were done. This was something that was pointed out by one of the participants as they additionally asked, “what happens now”? A question which the hi-fi prototype was supposed to try to answer. Initially, questions rose towards if there was any value of doing something with the information that the users would tell the cloud. But the findings from the task where participants got to write their thoughts down showed that none of the participants felt the need of seeing that information again, where they rather preferred the opposite. They liked that they could get rid of the paper with their thoughts. So, part of the exploration for the test should rather focus on how to give the proper feeling of getting rid of the thoughts and see if additional elements could be added to strengthen that particular feeling.

6.7.2 Findings

As the participants got to try out the idea in the intended situation in their own home environment, more detailed insights regarding the experience of how it
feels to use could be found. When it comes to the actual interaction of getting your thoughts and worries out before bedtime, the answers were similar to the test where participants got to write the thoughts down. As in that previous test, the need for doing something with the information was found to not be appropriate. Similar to putting the paper away, participants experienced in a way of being relieved from their worries and thoughts as they put away the cloud. One participant said “it’s like saying goodnight in a way” while discussing the interaction of turning the cloud off and putting it away. As one of the goals for this particular user test was to find out how the indication of “getting rid” of your thoughts would give the best experience. But as it seems, turning off the light was well enough where none of the participants mentioned anything negative about it, instead, it was mentioned as a good indicator.

As for the shape and form of the design, again the participants liked that it was soft with the appearance of a cloud. But at the same time, it was mentioned that they didn’t rule out other forms and shapes as they thought it could be interesting to see the design to be larger. One mentioned that it would be nice to have it really big but still soft with an increasing light. Mentioned was that maybe as it gets bigger it would feel more like talking to someone where the artefact in a way would get a kind of identity whereas the cloud is more like talking to a glowing pillow. But by having it small, and maybe even smaller than the current form, they mentioned it could feel more intimate and increase the calming effect. Then it would also be easy to hide it as to hide away their thoughts.

Concerning the buttons, they helped in the way that the participants felt like they had more control of the cloud and could decide themselves when to talk and when they felt it was enough. No clear insight on if the interaction of buttons itself was not found, rather giving the users the feeling of control is the important aspect found.

6.8 Final Design Proposal

The habit of getting rid of your thoughts as a means for winding down and reduce the stress levels seem by the results from the user testing as a well-functioning method. Therefore, for the final design proposal, the core idea of The Worry Cloud will remain, where the focus for iterations instead is on the material and forms of interaction.

The looks in the final design proposal for The Worry Cloud is close to the previous one where the form of a soft cloud is made out of cotton and white fabric. To indicate and embody the thoughts of the user, lights would continue to be used for that purpose as it was expressed as positive in the user tests. Though, the proposal is to have the cloud in a smaller size where the intended goal is to make the interaction more intimate and increase the calming effect. To increase the feeling of having it as a cloud and not make it too much of an object, instead of using buttons for the user it would be tried out by having the user to squeeze the whole cloud to start it and squeeze it again to turn it off. The
users liked to have control of the interaction in some way, where the controls could take different forms than buttons. By having that interaction in the form of squeezing the whole cloud it is aimed to further give a calming effect to it while keeping the perceived control.

7 Discussion

7.1 Insights and Value

The goal of this project was to develop an aid to reduce the stress levels among students. Approaching this project, assumptions was that it was mostly during school work that student would be the most stressed. Literature and related work showed on positive effects on meditation and breathing exercises, where related work such as You Can’t Force Calm (see 3.2.2) and Peripheral Paced Respiration (see 3.2.3) intend to be used during work, as the assumption was to be appropriate for this project as well was. Expectations were that it would be suitable for students to have helping design to interact with during school work. This ended up as a false assumption where the key insight from the user research phase was that it’s in the home environment they feel the most stressed. Interestingly enough, you would assume that it’s in the home that they should feel the most relieved and calm, not the most stressed.

As the literature review provided useful information on underlying facts on stress and sleep, the user research focused more on the emotions and feelings students express concerning stress. It could have been easy to create a design purely based on the theories on stress, but this wouldn’t have been based on the target users in particular. The importance was to gain insights on actual experiences with stress and to understand the actual needs of the users instead of just telling them “this is how you’re supposed to cope with stress”. As the home was found to be the most stressful environment, the questions were how a product could help in reducing this stress? As further user research gained insights on that it’s at bedtime when they have time to think they experience a lot of stress which also affects their sleep in a negative way, which only might make the stress even worse. The project ended up taking a turn from the assumption of a solution to be used during work to an artefact to be used at home to wind down.

Based on the findings, the design proposal of The Worry Cloud was presented. The final design of The Worry Cloud enabled the users to be relieved from their thoughts and wind down before bedtime. The design proposal aims to reduce stress among students by enabling and helping them to get rid of their thoughts and worries as this seems to be the main problem for their stress. In conjunction, the problem this solution also seeks to aid is the sleeping problems that are connected to stress.
What is fair to ask is if the final design actually does help in reducing the stress levels among students. While the design decisions are based on insight from throughout the user research and design process, the question is if it helps over time. The work of an interaction designer is to understand the underlying problems with the users, where users sometimes tend to have a hard time expressing in words exactly what they need or want. The trick is to find these touchpoints and design what the user might not have known they needed. The user research ended up pointing on the problem of having worries and control issues which they tended to reflect and worry about at bedtime, which made them stressed. Many don’t seem to know the connecting sleep has with stress, more than that they can express how stress sometimes results in sleep loss for them. But as the theory shows, not getting enough sleep can make the response to stress less effective. What was aimed to do with the design was to bring the theories of sleep and all the positive effects it has on health and the coping of stress. By getting the students to unwind at bedtime and at the same time make them sleep better, the hypotheses were that it will over time result in reduced stress overall.

While the goal was to reduce the stress among students, at this point, it’s still quite hard to answer if it was achieved. The design was mentioned as positive and made participants feel relieved in the actual moment it was used. The practice of getting the thoughts and worries out before bedtime results in a felt reduction of stress in the moment. But it’s at this point hard to say if the design helps in improvement in the long term. Further and more extensive work would be needed to find out more about how the practice of telling your worries to an artefact really helps in the reduction of stress.

7.2 The Design

The focus has been put on the feeling of the design. Many factors needed to be taken into consideration, all from how indications are given to what materials that are used. The design choices tended to end up with a focus on soft materials as it was revealed and pointed out by participants at different stages in the user research as a calming factor. Additionally, since the environment seemed to be the key factor for the users on where stress is experienced, it was natural to focus on integrating light as it can have a great impact on the overall environment.

Discussions concern if the shape of a cloud is the most appropriate for this cause. As the main idea is to visualize something filling up with your worries to increase the feeling of winding down, other ways to the design the artefact and its interactions could have been explored. How would the experience be if it would increase in volume as you speak to it instead of an increasing light? That could possibly increase the feeling of getting rid of one’s worries, where feelings and worries might feel big on the inside it could be appropriate to make them look as big on the outside too as an embodiment. This could possibly enhance the feeling of getting the thought out of their head.
As mentioned by the users, it would be interesting to see how the cloud would be received if the current design was presented as ten times bigger. What impact would that have on the experience of the idea? Maybe it would increase the feeling of getting rid of the worries or it could end up weird and give the feeling similar to as if you were talking to a wall. On the other hand, by having the artefact small and soft, it could be thrown away without fear of breaking it and it could give the users a feeling of throwing away the worries. If it was bigger but still soft, maybe users would hit the cloud as they speak to it to increase the feeling of getting rid of tensions. Like an interactive punching bag that listens to you like a therapist. Questions and wonders that could be in interest for future work.

7.3 Critical Evaluation

While the final design is based on user research, it needs to be taken in consideration that mental health is a sensitive topic for many and that parts of the research might be biased as the participants might have felt somewhat uncomfortable and not being truly honest about their problems related to stress. It might also be a topic concerning feelings and experiences that are hard to put to words, and therefore unintentionally not being truly honest in their answers as they don’t know how to put it.

The design proposal uses the theory of winding down by getting out your thoughts and worries. If an artefact improves this activity is a question that needs to be pointed out. How much of a difference does it make to talk to an artefact instead of writing it down on a piece of paper? It’s fair to ask if the design just ends up as unnecessary step in this activity that doesn’t bring any value to it. Maybe it works in confliction and fails to encourage the users to perform this kind of activity. But this is a question that at the same time goes in conjunction with future work would be needed with the cognitive side of the design.

8 Conclusion

The purpose of this thesis was to aim for a solution to reduce the stress among students. An understanding of stress, stressors and stress management was firstly done which made the path for the user research in addition to having the knowledge in consideration throughout the whole design process. It is safe to say that it’s important to keep the stress levels down in each and everyone’s lives as it has great impacts on the health overall. As stress especially has an impact on sleep, and sleep in itself has major importance on health and cognitive functions, getting a good night’s rest becomes an even more important aspect to consider.
As the most important part of this process was to understand and include the users, the appropriate methods such as interviews and workshops were conducted which yielded closer and deeper dialog with the users. The most important and intriguing finding was that it’s in the home environment where the most students felt stressed since as they put away the school work, thoughts and worries about school surface which in this case is a stressor. As it appears, it’s in the environment where they should be the calmest, they are the most stressed. With this key insight, the focus was put on a design that would aid students to wind down and not worry too much about school. With the additional finding that their sleep is affected by their stress and worries, coupled with the knowledge of sleep’s importance to cope with stress, the design aims to reduce stress by getting them to sleep.

As for the question if the design reaches the goal of this thesis, further work requires to be made where extensive research on the cognitive side of the design would need to be evaluated. The current design of The Worry Cloud is for now satisfying for some extent when it comes to interacting with it and the usage of materials and elements. While it needs to be pointed out that even though the user tests showed the design as satisfactory, pleasing and positive, it doesn’t rule out that other forms should be explored to enhance the interaction.

To summarize the knowledge this thesis gave, stress is experienced differently from each and everyone but can be induced in the most unexpected places where you think you would be calm. Stress is not just something that appears when you do stressful work but rather appears while thinking and worrying about the work. Students these days are under pressure both from school and from themselves with high expectations on how to succeed. Rather than questioning how to eliminate the stress from students’ lives, the question was how to help them cope with the pressure and not let it take control of their lives.

9 References


