Behavior Change Support Systems

TEST ANXIETY SUPPORT SYSTEM

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ABSTRACT

Mental health problem of "Test Anxiety" is a great problem among students of University of Delft. This behaviour of test anxiety stresses and burns out an average student resulting in decreased productivity, increased fear of failure and evident symptoms of anxiety. Many applications have been developed in the past and have yielded notable results. However, it is shown that it is difficult to change a existing behaviour or habit of a person. To overcome this undesirable behaviour of test anxiety we as a team have proposed a behaviour change support system in the form of a mental health application that can be used by the students. The aim of this application and behaviour change is to further reduce the test anxiety among students in addition to their motivation to perform better after a failure in exams. Our application will set goals for the students to reduce their anxiety and stress levels during their exam preparation and reward them for achieving the set goals. The feature of notification at timed intervals will remind them about the set goals and help them stay stress free by structuring their study plans, break times, and giving motivational quotes. As an overview of their progress, the student gets a progress report of their daily progress and how they have fared better than other participants of the application on a general scale without invading privacy of other students.

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INTRODUCTION

Anxiety faced by students can be defined as a state of uneasiness, apprehension. Our application helps reduce anxiety which is a toxic behaviour caused mainly because of stress among students aged between 16 to 25 years old over a period of 2 months. Research shows that students especially in the university life exhibit high levels of stress and anxiety. Racing heart, restlessness, worrying about peer performance, headaches, inability to rest are a few symptoms to enlist.

Students are subjected to strategies of tackling this anxious behaviour by doing task orientation and preparation, seeking social support, and avoidance as mentioned in [1]. In [1], the author has cited relations between anxiety and their causes in four ways. The four causes of test anxiety were worry, emotionality, interference and lack of confidence. They cite that worry and emotionality were directly related and interference was inversely related to task-orientation and preparation. Additionally worry was related to avoidance of thinking, ”emotionality” was related to seeking social support, “interference” was mainly related to avoidance whereas lack of confidence was related to avoidance. The author further states that the focus on examination situation alone doesn’t help us understand the anxiety behaviour and hence we should focus on learning phase , preparation phase and post result phase.

We have designed a mental health application for a targeted behavior change. We have chosen “Test Anxiety" as the behaviour we wish to change in students who face exams in TU Delft. In the pursuit of annihilation of worry, fear of failure and being less productive during exam situations; we as a team have designed an application that will help the students to cope up with. Emotional distress has a direct impact on exam performance, exam preparation. This is because of the reasons like exam situations, the need to prove oneself and getting a good score creates a sense of threat and anxiety in the student. So, the target outcome is to reduce anxiety which is a type of mental health problem for students aged 16 to 25 years within a span of 3 months.

In order to design our support system, we will employ the four stages that are introduced by Wendel [2]: Understand, Discover, Design, and Refine. The design proposal will be structured as follows. In the first chapter, we try to understand the target domain better, by

defining the problem, targeted behavior change, and some barriers that our user have to overcome in order to reach the outcome. The second chapter will explore more about our intended target behavior with a list of target actions that the user should take for the outcome to be achieved. The proposal then continues with the three chapters of the design stage which focuses on developing the behavioral plan as well as a prototype of the interface for our product. Lastly, the proposal will also discuss some evaluation to refine our initial product design.

TARGET DOMAIN

The Problem

Students generally after a failure have a negative attitude of “I don’t want to face this exam” which is an A-Change. This behaviour poses as a problem when it affects the confidence level of the students. Test anxiety is a combination of physiological over-arousal, tension and somatic symptoms, along with worry, dread, fear of failure, and catastrophizing, that occur before or during test

Targeted Behavior Change

The targeted behaviour change is attitude change and behaviour change. A-change(attitude) like: “I don’t want to face the exam”, “I fear facing exam”. “B-change(behavioural)”: procrastinating, study habits

The targeted behaviour change we are encountering is an A/A-Change as would be described in an Oinas-Kukkonen Outcome/Change Design Matrix: altering an attitude. Reducing test anxiety is an A-Change because we want to change the user’s attitude, rather than only behaviour. Stop obstructive thoughts towards giving tests. It is a user’s state of mind that has to be changed, rather than changing actual behavior (B-change) or an act of complying the change (C-change).

The resulting outcome is an A-outcome (altering). We want to alter a person’s response to writing a test and the mindset about that, rather than forming or even reinforcing the existing attitude.

User Motivation

It is quite evident on why the user would use our Behavioral Change support system since all the symptoms one undergos is quite disturbing and unpleasant. The stated combinations symptoms is a nightmare scenario which is the reaction of the body from too much adrenaline in the system. However, when the user of our app would turn his/her exam fright into healthy nerves on regular basis, it would have a positive effect: contrary to

what you may think, nerves are a good thing now. They make your body create energy to help you cope with a difficult situation while writing an exam. The adrenaline coursing through your veins when you are keyed up before an exam makes you quite alert: you think quickly, you are very awake , you have boundless energy. This energy comes across when you are writing the exam. So nerves serve a purpose [2]. The user is also motivated on a large scale to use our app, due to bad grades in his previous performances. Overall the overwhelming effects of test anxiety enable the user to start using the app for better results.

Existing Solutions and Treatments

Obviously suffering from exam anxiety is very bothersome. There are a lot of existing treatments available which try to help treat students facing this issue. They can be divided into two groups: First there's therapy, which helps people to understand and influence their thoughts. It helps people to create a healthier belief system and cope with failure or not being perfect. These therapy goals aim to lead to cure test anxiety. Second there are methods to handle with the anxiety on the spot when faced. Multiple examples of such methods are:

• Breathing exercises

• Breaking down big 'scary' tasks into multiple smaller 'easy' tasks

• Working out (e.g. running) and meditation

• Medicines

Next to existing treatments like stated therapy and self-handled methods there are multiple software applications available which can help people cope with performance anxiety. Some are listed in the table below.

Virtual Reality	Virtual Reality therapy (VRT) helps treat test anxiety to a great extent. [3]
MindShift App	Helps people struggling with anxiety in general

HelloMind App	Helps overcome low self esteem, fear, stress, bad sleep and helps an individual to think and feel stronger
MindSpace App	An app for mindfulness and meditation

TARGET BEHAVIOR

Product Vision

In order to have one main idea to keep in mind while designing our product to support behavior change, we define our product vision. This product vision is the main reason why we decided to design our product in the first place. Formally we define our product vision as follows:

"The product should help **students** to **overcome stress and anxiety** while facing **exams** in their study"

In designing our product, our main aim is to help student cope with anxiety when facing in exams in three stages: before the exam, while doing the exam, and after the exam. One thing to point is that our main goal is to help students feel better about exams, not to achieve perfect score. Although we believe by helping students by setting a positive mindset towards an exam can lead them to achieve better result.

Target Outcome

To define our target outcome, we try to answer four basic questions consisting of "What?", "Which Type?", "Where?", and "When"?

What?	Reduce test anxiety
Which type?	Feeling of stress and anxiety while facing exams
Where?	Among students in TU Delft
When?	Within usage of one study period (around 3 months in TU Delft)

The defined target outcome is now stated as follows:

"This product should help to **reduce self-assessed test anxiety** while facing **exams** among **students in TU Delft** over a period of **three months**"

Measuring Outcome

As our target outcome involves anxiety level which is a state of mind, it is a challenge to define a metric for the outcome to be measurable. Nevertheless, we try to define a self-assessed report from the user as the metric of their anxiety level. We define a simplified questions that would be asked to the user periodically. The questions will help us to decide if a user feels “positive” or “negative” towards the test both before and after taking the test.

To measure its success, the product should help our user to feel positive 80% of the time while facing their exams. For example, if in one study period a user has to face 5 exams, they should rate 4 exams out of 5 as “positive”.

Target Users

The target user of our support system would generally be any student who is constantly has to face exams in order to pass the courses they they are taking. To narrow our target user, our product would like to focus on university students -- both undergraduate and graduate ones -- who are mostly likely to be aged between 16 - 25 years old. Even more specific, we are targeting users who are studying in Delft University of Technology, as we know better about the study load as a master student here.

Personas

In order to illustrate our target users better, we would like to introduce two personas that represent typical students that would be supported by our product to face their exams. We would call these two persona as John and Jane.

John

John is a master student majoring in computer science. He is just starting out on his master programme, and has just finished his exams last quarter. He is facing an exam to pass a course in the near future, but he did not understand much about the courses that he is taking, and felt pointless to study hard for those exams. He tried to schedule a study plan,

but because he felt that he will get a bad grade anyway however hard he studies, he procrastinates all the time and fails at sticking to his schedule. He feels like it would be better to just drop the course and not take the exam at all.

Jane

Jane is a bachelor student who. She has just failed an exam. She did study hard for a week before, but she didn't get much sleep the night before the exam. To make things worse, while in the examination room, she could not think clearly thus could not come up with any answer for most questions. She did actually know the answer to this questions, but she remembered just after the exam has ended.

Target Actions

In this section, we try to list some target actions that the user should do in order to achieve the target outcome. With each action, we also defined the Minimum Viable Action (MVA), which is the simplest version of the action that the user could take. The list of actions each with their MVA is listed in the table below:

#	Target Action	Minimum Viable Action
1	The user should learn more about the material that is covered by the exam.	The user should read the syllabus of the exam.
2	The user should make an organized study schedule and stick to it.	The user should make a study plan for one day and tries to follow it.
3	The user should take study breaks regularly.	The user should setup a reminder to take a break while their studying.
4	The user should have positive thoughts toward upcoming and past exams.	The user should convert their negative thoughts into positive thoughts.
5	The user should maintain their health by eating well and exercising regularly.	The user should exercise once.
6	The user should get enough sleep especially the night before the exam.	The user should sleep early the night before the exam.

7	The user should take time to socialize with friends and family.	The user should talk to a friend once before an exam.
8	The user should do some tension-release exercise whenever they start to feel anxious.	The user should do a tension-release exercise once.
9	The user should learn how to praise themselves for getting through an exam regardless of results.	The user should name one good thing that they did regarding the exam.
10	The user should learn how to focus and not be distracted while taking an exam.	The user should read tips on how to stay focus in exams.
11	The user user should be able to objectively evaluate their experience on past exam	The user should rate the whole exam experience as positive or negative

Most of the target actions listed above is based on a booklet by Educational Testing Service about how to reduce test anxiety [5]. The booklet discusses several factors that might cause test anxiety and suggest a solution for each cause. For example, Action 1 which suggest the user to learn more about the exam is to aid the anxiety cause of not knowing the exam well enough.

A more elaboration on Action 11 is to define what “exam experience” is. We define “exam experience” as the whole process of facing an exam, from planning to study for the exam and going through the exam itself. We think evaluating the whole exam experience is important for the user to be aware of what their attitude for the exam.

In order to evaluate which actions have the most impact with least effort for the user, we rate each action for the levels of three criteria: Impact, Motivation, and Ease. We disregard the cost criteria as we are focusing on a user-oriented product rather than business-oriented one. The rating for each action is listed on the table below:

#	Impact	Motivation	Ease	Explanation
1	Medium	Medium	High	Knowing what are the materials covered by an exam is easy enough and should help the user to know what they are facing better
2	High	Low	Low	Having a good study habit has been indicated

				to have significant relationship to test anxiety [4]. Having a study plan and sticking to it should have a big impact to reduce the worry of the user towards an exam, although it is not an easy task.
3	Medium	High	High	Taking a break is important and should help relieve stress for studying too much for the exam. The effort to do this is also not difficult.
4	High	Medium	Medium	The impact of having positive thoughts to anxiety level is very high, and the user should be willing to do so, although it is not as easy as it sounds like.
5	Low	Low	Low	Exercising regularly does not have that high of a impact compared to other actions. It is not that easy to accomplish either especially if the user is not used to this habit.
6	Medium	Low	Low	For our users, getting enough sleep before an exam is hard to do because the user would worry too much about the exam.
7	Low	Medium	Medium	The user would be too immersed in their study that they feel like socializing with friends is a waste of time.
8	Low	Medium	High	The impact of tension release exercise is not that high, and the motivation is medium because it is not a part of the user's habit yet. On the other hand, this kind of exercise is fairly easy to do.
9	Low	Medium	Medium	It is not easy to stay optimistic after getting through an exam. The user will worry about the result.
10	Medium	Medium	Low	If the user regularly get distracted or their mind goes blank when taking an exam, it is hard to stay focus especially in a test environment.
11	Medium	Medium	High	Rating an exam experience as either positive or negative is easy, but the user would most likely not too motivated to do this because they want to forget about the exam immediately. The impact would be moderate

				for the intended outcome, because this would help the user to be more aware of their feelings toward exams.

Based on the rating that we give for the three criteria of each action, we disregarded action the action that does not have any high rating on any of the criteria. We shortlisted our action list to be the following:

1. The user should learn more about the material that is covered by the exam.
2. The user should have positive thoughts toward upcoming and past exams.
3. The user should do some tension-release exercise whenever they start to feel anxious.
4. The user should make an organized study schedule and stick to it.
5. The user should take study breaks regularly.
6. The user user should be able to objectively evaluate their experience on past exam.

Additional Constraints

Additionally, we would like to define additional constraints to restrict the size and scope our product. First of all, the product would be a mobile application and to be designed within 8 weeks. The working hours for designing this product should fit into 50 hours per person, which means 3x50 man-hours because there are 3 people in our team. Another constraint would be the tone of our product, as we aim for a relaxed and fun color to it. As for the target audience, for this product we restrict it to the students of TU Delft that constantly feels test anxiety whenever exam period is coming.

CHANGE SUPPORT STRATEGY

Behavioral Plan

In order to help us understand better of what the user would do in order to change their attitude and behavior towards an exam, we construct a sequential behavioral plan from when user starts feeling distressed because of having to face an exam until they overcome the stress and successfully passed the exam with reduced anxiety. The overall behavior plan is depicted below.

1. **AWARE** that the user have anxiety in exam preparation
    - Fail at some exams
    - Not sure how to prepare for next exam
    - Worrying about the result of next exam
    - Acknowledge that the user have anxiety in exam preparation
    - Realize that the user need to do something for upcoming exam

2. **EXPLORE**
    - Read more about understanding test anxiety
    - Read more about how to prepare for an exam
    - Read more articles about making study plan
    - Read more about how to study effectively
    - Find about our app
    - Decide to know more about our app -- will this product help?

3. **UNDERSTAND**
    - Download our app
    - Install our app
    - Open the app
    - Explore the functionalities of our app
    - Decide if this app is beneficial for the user
        - **Yes?** Explore more about each features
        - **No?** Leave
    - Decide which features are useful for the user's situation
    - Decide to use the app

4. **USE THE APP**
    - Be assisted of tips on overcoming test anxiety
    - Schedule a study plan
    - List what material to master for the day
    - Start a study session for each material
    - Take a break every 25 minutes
    - Do tense-release exercise
    - Do positive thought exercise for upcoming exam and past exam
    - Rate an exam experience

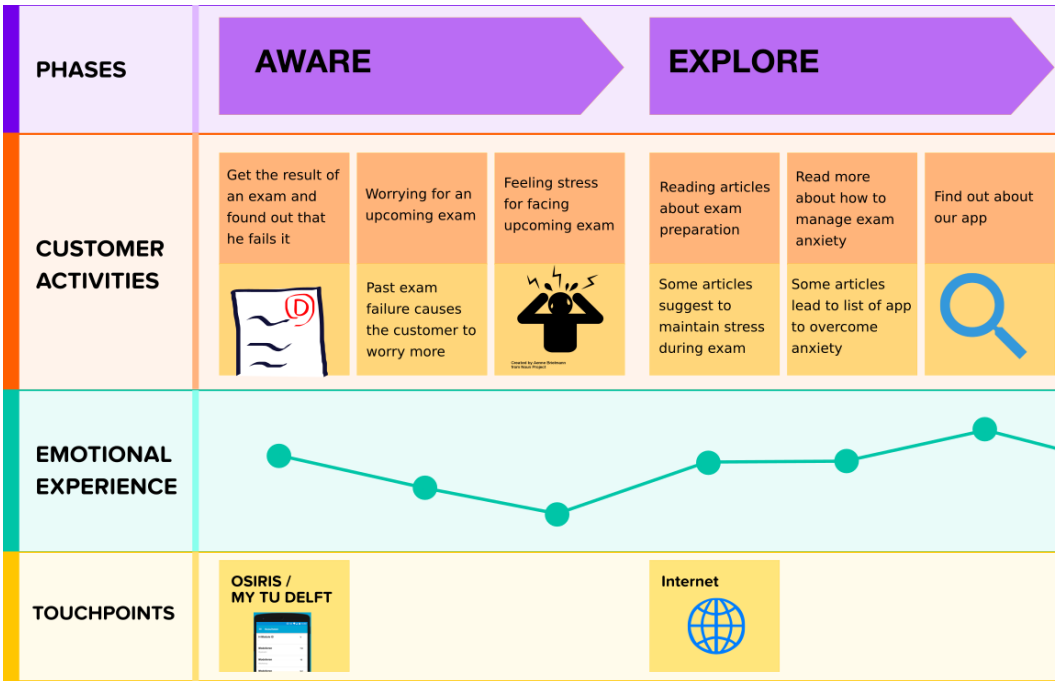
Customer Experience Map

In this section, we illustrate a customer experience map that we derived from the behavioural plan from the previous section. This customer experience map helps us to explain clearly and in detail of the user's journey: from experiencing an exam failure until they discover our app to help them overcome their anxiety while facing for another exam. The experience map also includes the emotional experience of the user, with low emotional experience means they are either confused, sad, or stressed and high experience means they are either happy, optimistic, or excited.

The experience map spans to five different phases: Aware, Explore, Understand, Use the app, and Exam. To discuss the map in detail, here we divide and show the map into three parts.

Aware and Explore Phase

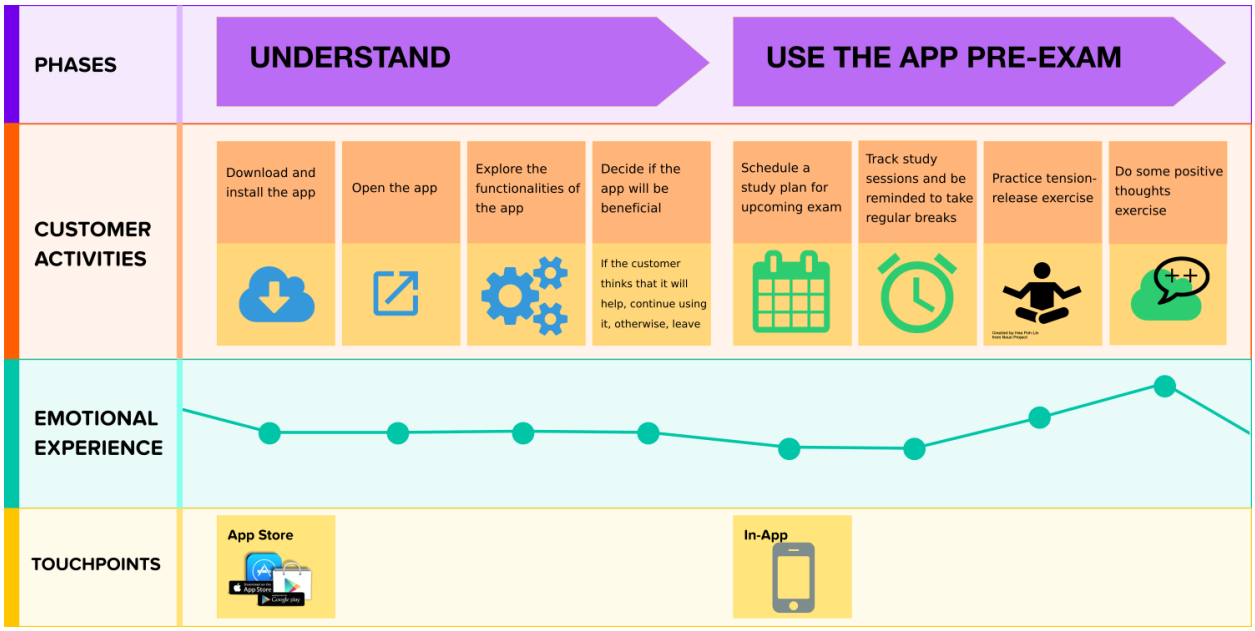
The user's journey start from the Aware phase and continues to the Explore phase. This two phases of the journey is depicted in the figure below.



The story starts when user has just finished an exam and found out that they didn't get sufficient grade to pass the exam. The user starts to worry about upcoming exam and feel distressed about it. This is when the user decided to search more about how to properly plan for an exam and how to cope anxiety that comes with it. In this case, we assume the user uses the internet in the explore part, and at some point they found out about our app through links related to exam anxiety coping app. Note that these two phases consist of user activities outside our app.

Understand and App Usage Phase

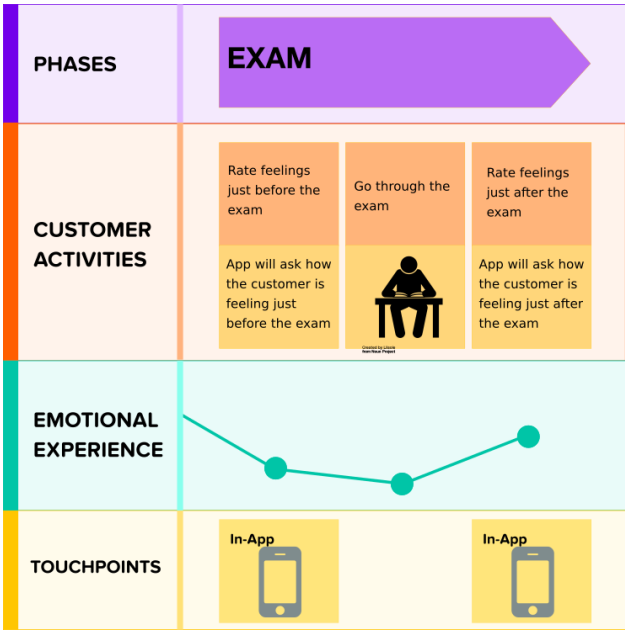
After the Explore phase, the journey continues to the Understand phase and the App Usage phase. These two phases are depicted in the following figure.



In the Understand phase, the user first download and open our app, and tries out the features that our app has to offer. From then, they try to decide if the app will be helpful in assisting them to face their upcoming exam. If the user thinks it will be helpful, they will decide to use the app. Note that both of these phases involve user activities inside our app. Some of these activities do not really require our app support at all, nevertheless our app tries to facilitate the user to make the activity easier, such as automating study planning and giving audio-guided exercise for tension release and positive thinking.

Exam Phase

Finally, the customer journey map ends in the Exam phase depicted in the following figure.



This phase consists of the user going through the exam itself, with additional notification from the app to evaluate the user's feeling both just before and after the exam. This evaluation will help the user to be more aware of their attitude towards the exam. If our app is successful, the user should feel positive in both situations.

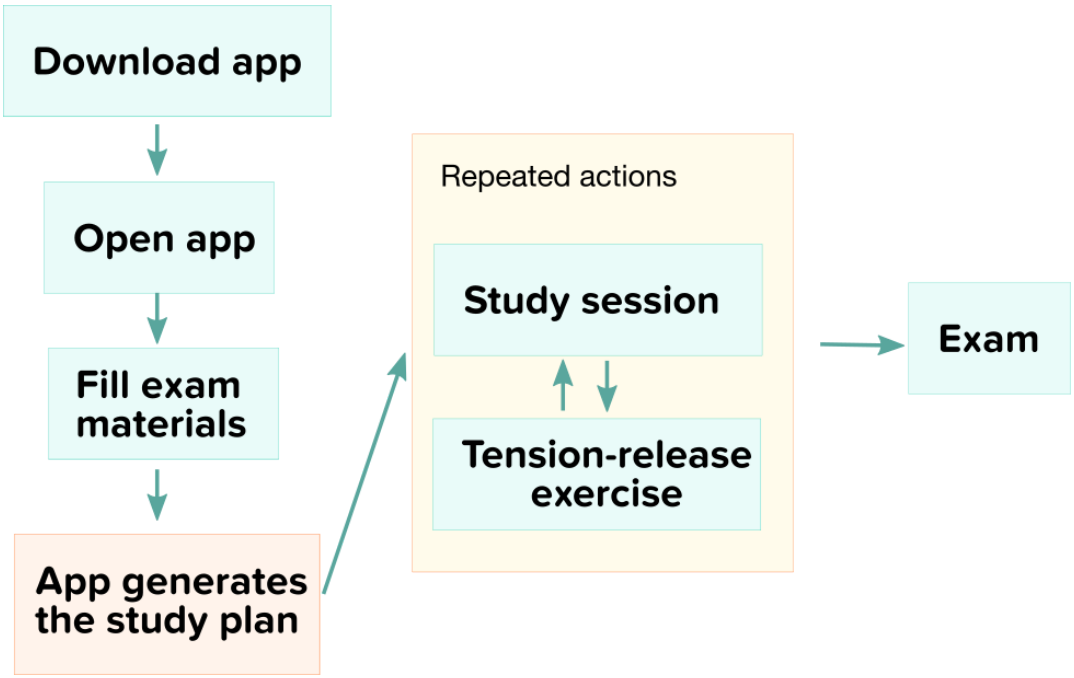
The journey of our user actually does not end here. In fact, this is the part where the user will decide to do one the followings:

- They think the app is useful and need more assistance for another exam.
- They already feel positive enough that they do not need to use the app anymore.
- They think the app is not helping him at all, and decide to uninstall the app.

Our app will be deemed successful if the user ends the journey with one of the first two possibilities.

Minimum Viable Action

As explained in the Behavioral Plan and Customer Experience Map, we realize that there are too many actions that user would have to do in order to user our application. The user would probably think that the application is too complex and decide to quit using our application. In order to avoid that, we try to reduce the complexity of the actions that the user have to take to help them overcome their exam anxiety. The resulting behaviour plan with the simplified action is depicted in the following figure.



Action Funnel

In this section, we try to review our behavioral plan based on the Action Funnel, which is a model that describes five preconditions or stages that would lead for an action to occur [6]. Here, we assume that the user has already downloaded the app and we try to evaluate how the user would decide to open the app and start to plan a study schedule for an upcoming exam.

Cue

The action funnel starts with *Cue* as the first stage. The user starts to remember that they have installed our app because of a trigger that they encounter. In the case of our app, the trigger could be either seeing the result of past exam or be reminded that they have an upcoming exam in the future. This triggers will give a cue to the user to notice that they have installed the app in the past to assist them preparing for upcoming exam.

Reaction

The next stage is the *Reaction* stage where the user give an initial reaction to the thought opening our after passing the *Cue* stage. The user thought process does not give that much of an effort to give this reaction. Some aspects of the app like good icon design will have to boost positive reaction of the user and motivate them more to open the app. In the case of existing user who already has positive past experience of the app, the reaction might automatically initiate the intended action of opening our app.

Evaluation

When the user passes the *Reaction* stage and does not get distracted, the user thought process carries on to a more conscious level which is the *Evaluation* stage. The user will try to evaluate the benefits and costs of opening the app. The app description of which the user read before downloading the app should help the user to consider whether the app will be beneficial or not. Again, for experienced user who has already use the app before, this stage might as well be skipped by the user, as they already know what they gained by past experience of using the app.

Ability

After the user has made a choice and decide to open the app, the user yet still to consider if opening the app is actually feasible or not. This is where the *Ability* stage comes in, where several conditions have to be met for the action to take place. Examples of such conditions are skills (does the user knows *how* to open and use the app?) and resources (does their phone have enough battery left for the user to be able to use the app?). In order to

motivate the user in this stage, our app has to promote easy to use features and low battery consumption.

Timing

The last stage of the Action Funnel is the *Timing* stage. Once user passes all of the previous stages, the user will actually have to decide whether the action would have to occur *now*, or is there any other more urgent matters that they need to postpone opening the app. We are not really able to affect this stage, but we can increase the urgency by giving notification when we already know when is the upcoming exam will take place. Again in this case, we assume that the user has already open and use the app at least once. For first time user, it would be tricky because the *timing* factor has to come from themselves.

Hook Model

This section will discuss some evaluations of our behavioral model based on the Hook Model [1] to promote continuous and regular usage of our app. The model is a cycle consisting of four main stages: Trigger, Action, Rewards, and Investment. Here we assume that the user already open and use the app once to enter their exam date(s) and materials, and our focus target action is for the user to use the app for tracking study sessions.

Trigger

The user should be triggered by a notification from the app that reminds the user of their study schedule. This notification should be motivating enough for the user to actually open the app

Action

The targeted action is for the user to open the app and track a study session based on the exam material(s) that they need to comprehend by the end of the session.

Rewards

For each study session it will be focusing on one exam material for the user to comprehend. The user will be able to see their progress of studying for the exam as a reward of finishing a study session.

Investment

Our user should invest enough time when they just start using the app such as filling exam date(s) and listing materials covered by the exam. They also gain progress report of their study, and would not want to lose this, thus leading the user to use the app again for tracking yet another study session.

CONCEPTUAL DESIGN

The conceptual design of our Exam Anxiety application gives us developers the product's core concepts and its functional goals. The Conceptual Design consists of 3 phases:

- Structuring the action that makes the product to be easily implemented by the user
- Constructing the environment helping in supporting the structured action
- Preparing the user to take the structured action

Constructing the Environment

There are five major ways in which the product can construct the users behaviour

- Increase Motivation
    - Understand the focus area where motivation for the user is required
    - Provide the required motivation as notifications at regular intervals/
    - Provide a scoring system which acts like a rewarding system(a source of encouragement) for the user.

- Cue to user to Act
    - Measure how efficient the user is and accordingly provide notifications at regular intervals if he/she is not efficient

- Generate a feedback loop
    - A timely clear and actionable feedback is provided to the user on weekly basis for self-analysis and encouragement to use the app

- Remove competition
    - Identify competition
        - If the user is no more using the app, try to find the root cause for the same.
        - Receive feedback of the app after the first three months
        - Find if more such apps exist in the market, if yes, then perform a survey if the app is User Friendly and more User Focused.
    - Strategy to counteract competition
        - Redesign the product to focus attention on the primary motivation
        - Provide mass marketing on social media platforms, so that more users can would get to know and use the app.

- Remove obstacles
    - Make sure the app is very User Friendly such that less time is taken in using the app, since the users are already in immense pressure .

- Make the user design simple so that it does not create an additional havoc in the user's mind.

Preparing the User

Our "Exam anxiety" application gives an intervention to the students regarding their current and past state to edit their past story and change that particular "behaviour" of the student that help them to adapt the "edited" story of success by reducing their anxious behaviour towards exam. This helps to change student's perception of the past anxious behaviour during exams and how they can see themselves now being productive and stress free which is an edited past story. The action done such as tracking a study session based on the exam material(s) that they need to comprehend by the end of the session to change past anxious behaviour which is due to improper planning.

Narrate the past to support future action

The students have a bad image of themselves that they are bound to fail the next upcoming exam and won't succeed in the study plan that they chalk out. This is toxic to their student life. Our application helps the students to see themselves differently after it interprets what has happened in the past due to their anxious behaviour and how the new behaviour they will adapt will give good performance results. The new action of taking the effort to follow a study plan will seem natural to the student because they have already tried to chalk out a plan in small ways and they need to do a bit more using the "exam anxiety" application. The reward to the action of following study schedule and reminders that act as cue to the students to follow the study plan would be to come out of anxiety. The application creates a model of the student who has followed the study plan, reminders, daily motivational quotes and breaks and is anxiety free during exam and the final exam results are relatively improved. The application improves self-efficacy of the student by helping them annihilate anxious behaviour and taking control of their lives.

Associate with the Positive and the Familiar

The new action of following the study plan is same as following the cue to study an interesting subject but according to planned schedule. This planned schedule consisting of all the subjects is provided by the "Exam Anxiety" application. This behaviour bridge

connects the future action by maxing use of the prior experiences of following a study plan. The student has to get used to the part of following the timeline allocated for each subject in order to keep every subject's preparation in synchronisation.

Educate Your Users

The action of following a study plan is not habitual to students who are experiencing anxiousness. Our application will educate the students as to why they should be following the study plan.The reason to for using the application is to improve grades in the exam from bad to average. The motivation is provided through motivational quotes, reminders and the image of a unsuccessful and successful user story image for the student to quickly understand the consequence of not following the study plan. The student's ability to take action is increased by the constant tracking the application does on behalf of the student.

How Training Your User Fits In

The application has skill building exercises inbuilt that trains the student to follow the study schedule slowly by giving them two to three subjects to study with lots of break time and lots of motivational thoughts and reminders that act as cues.There are four ways to check if the necessary skill of "concentrating and abiding by the study plan" are being developed. The sequence of action that the student is taking is following motivational quotes, schedule a study plan, list the material to study for the day, start a study session for each subject, taking a break every two hours, doing tension release exercise, a positive thought process exercise for the upcoming exam. The most challenging part the student may fail is where the student may be forced to postpone the study timing the app allocates as they may have other urgent errand to attend like tests in other subjects than the subject planned to study or a friend's birthday party in the time allocated to study. The student already has the idea of how to plan a study schedule and allocate a study schedule to compensate the wasted time, hence the student already has the skill to study and plan. The other ways of building similar small challenges is to ask the student to start memorising a formula sheet or concept recollection as a part of early training process.

Update the behavioral Plan

The behavioural plan for the student to overcome anxious behaviour is to be assisted of motivational thoughts on overcoming test anxiety, schedule a study plan ,list what material to master for the day, start a study session for each material, take a break every 2 hours, do tense-release exercise, do positive thought exercise for upcoming exam and past exam and rate an exam experience. The updated behavioural plan has skill building exercises by giving small challenges as stated above. The unnecessary information of the whole week's schedule is removed from student's view to avoid slowing down the student.

How Behaviour Change Techniques Relate to the Thought The Behaviour Requires

As only conscious thought of action is not enough, the automation and cheating with consent by sending regular notification on motivation / positive progress report at the end of the day, suggestions of the sequence of small easy ways to follow the study plan by memorising concepts and reminding the user of the success done by them during the course of the day. The most unfamiliar situations of accomodating the postponed and wasted time into the next day's study schedule or break time in order to achieve 100% in everyday's task is how behaviour change techniques relate to the thought process the behaviour requires.

USER INTERFACE

User Stories

Extracting User Stories from the Behavioural Plan

There are two major development strategies used.

- ***Agile+Lean development***

  Here the User story can directly be derived from the Behavioral Plan after the first release of the product and from it's corresponding user feedback. Let us consider a specific case of understanding the kind of notifications that the user would wish to see "As a user, I want to be reminded when it's time to run so I don't procrastinate ". "As a user, I want to think about the previous times I've succeeded at performing well in the test so this new challenge doesn't seem so scary"."As a user, I want to know an update on my activities on a daily basis." It can be inferred from the above mentioned user stories that the user wants reminders on "*Procrastination*", "*Successful past challenges*" and "*Daily Updates*"

- ***Sequential development***

  The formal specs are conveyed to the product development team for development. These formal specs are derived from User stories.

List of User Stories

The table below shows the corresponding user stories of each step the user has to take according to the behavior plan.

Behaviour Plan	User Stories
Product should help the user to schedule a study plan.	As a user, I want to schedule a study plan based on my exam date and exam materials.
Product should remind the user to do a study session.	As a user I want to be reminded to do study session according to my schedule.

Product should remind the user to take a study break regularly.	As a user I want to be reminded to take a break once in a while when doing a study session.
Product should guide the user to counter negative thoughts with positive ones.	As a user I want to be guided to think positive thoughts to encounter my negative thoughts.
Product should show the user how is the progress of their study.	As a user I want to be able to see my study progress.
Product should ask the user to evaluate their feelings and thoughts regarding upcoming and past exams.	As a user I want to be aware and evaluate my own feelings when I have to go through an exam.

Design Pattern

The two approaches to design patterns are High Touch and Low Touch.

High Touch Approaches

- Behavioural change Strategy

  The app motivates the user to a more positive side of taking a test and changes the behavioral thinking of the user.

- Planners

  The app provides a scheduler/Planner for the user to keep track of all the activities and assists in proper designing of the study schedule.

- Reminders

  Regular notifications are provided to avoid the user from getting distracted. Notifications on daily updates and other activities are also provided.

- Goal trackers

  Tracking user activities on everyday and weekly basis is recorded. Based on the activities measurable reward points are provided.

Low Touch Approaches

- An appeal to “think differently”

Daily points on motivation is provided to encourage the user and help the user to start thinking positively.

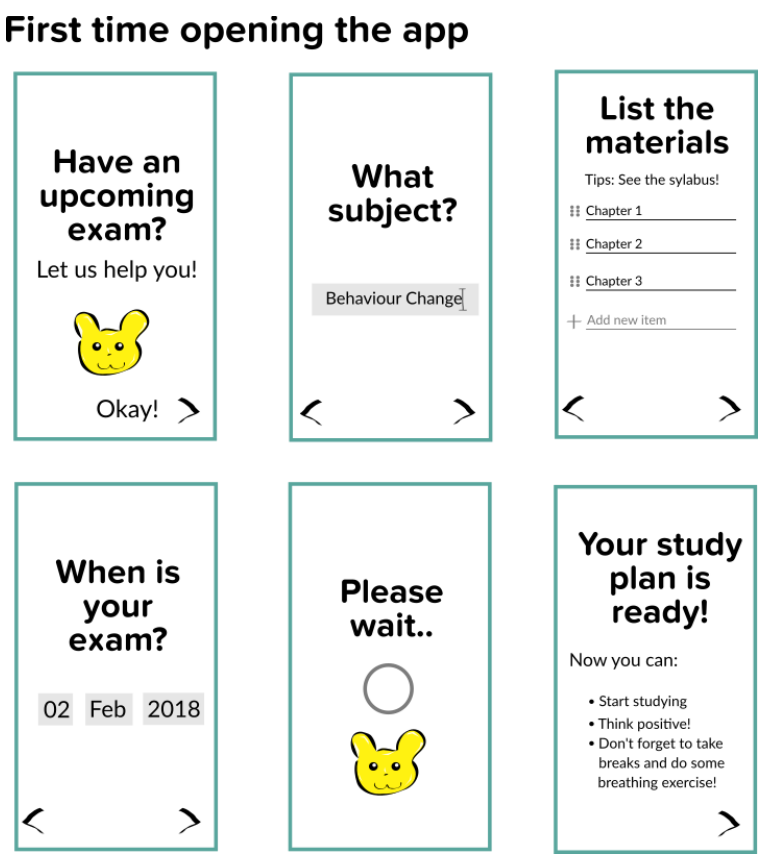
- How to tips
  Tips for the user to start thinking positively, motivational tips for the user to work towards their goals.
- Simple reminders and planning prompts
  Daily reminders to help users with their everyday to-do tasks and daily updates.
- Status reports
  A daily and weekly study status report is provided to the user for self analysis.

Mockups of User Interface

This section will illustrates the quick sketches of the designed user interface based on the the user stories extracted from our behavioural plan. For our support system, we divide the flow of the user action into four high level flows: Flow for First Time User, Main App Flow, Study Progress Flow, and Rating Exam Experience Flow.

Flow for First Time User

For user who opens our app for the first time, they are immediately guided to enter the details of their upcoming exam. It simply asks what is the subject of the exam, what materials does the exam cover, and when will the exam be held. The output of this flow would be an auto-generated study plan for the user's exam preparation. The user interface for this flow is roughly illustrated in the following figure.



Main Flow

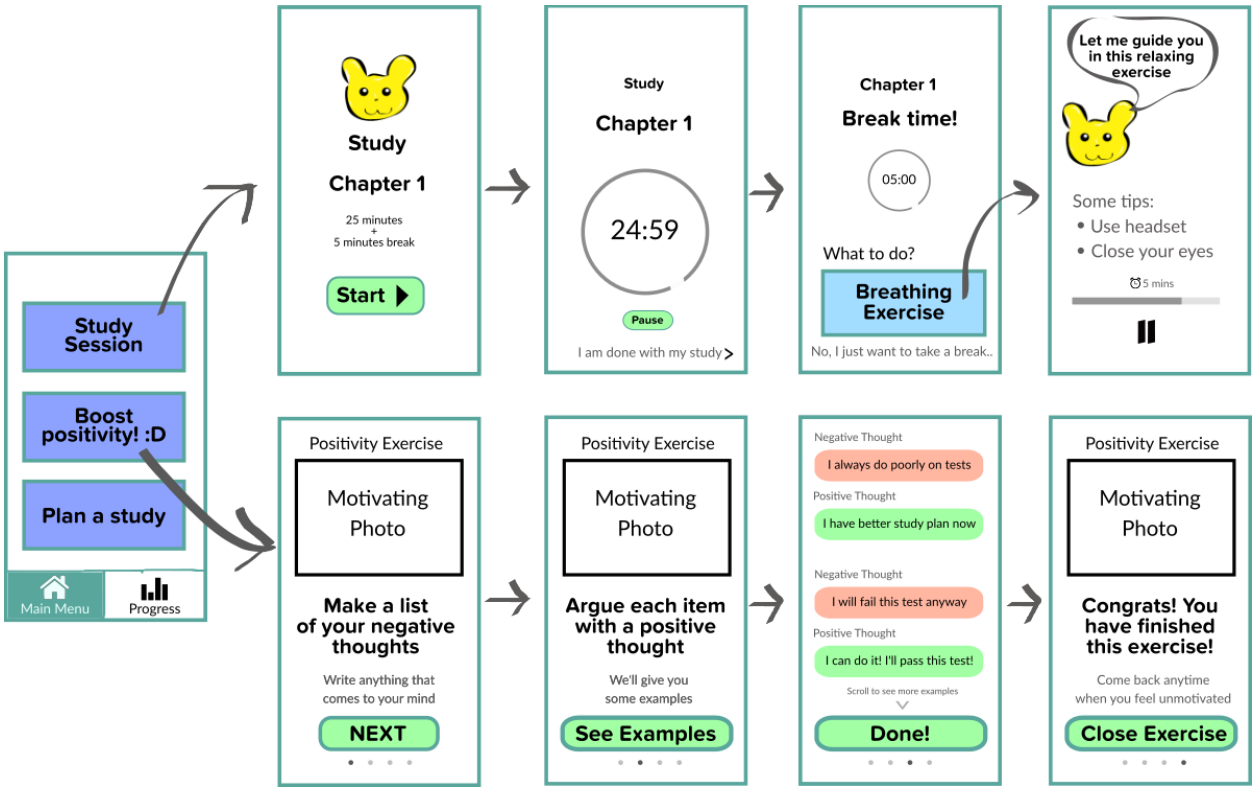
After a first-time user finish entering their first exam detail, or if existing user reopen our app, they will offered menu which offers three main features of the app.

The first menu leads the user to start a “study session” to help user focus on what to study. In a study session, the app will remind the user to take a 5-minute break for every 25 minutes, and also would be optionally offered to take a breathing exercise in each break.

For the “boost positivity” feature, the app will guide the user to do a positive thinking exercise. The guide will try to encourage the user to think positive by giving them some examples of how to turn a negative thought into a positive one.

Finally, the last menu will simply lead the user to plan a study for another upcoming exam by going to the similar flow for first time users.

The user interface for the main flow is depicted in the following figure.

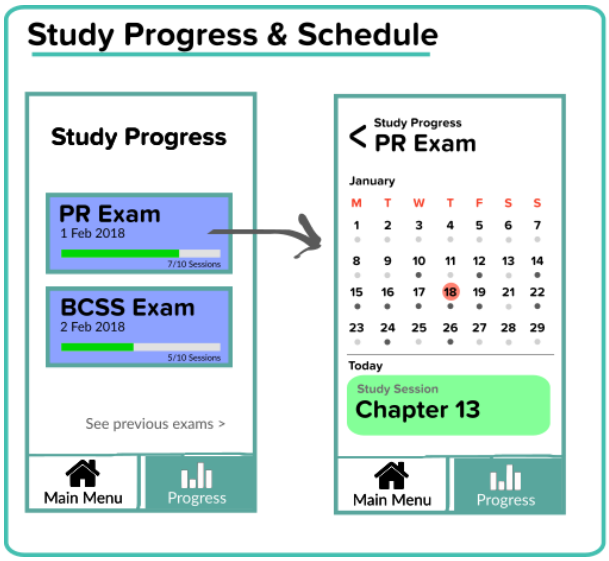


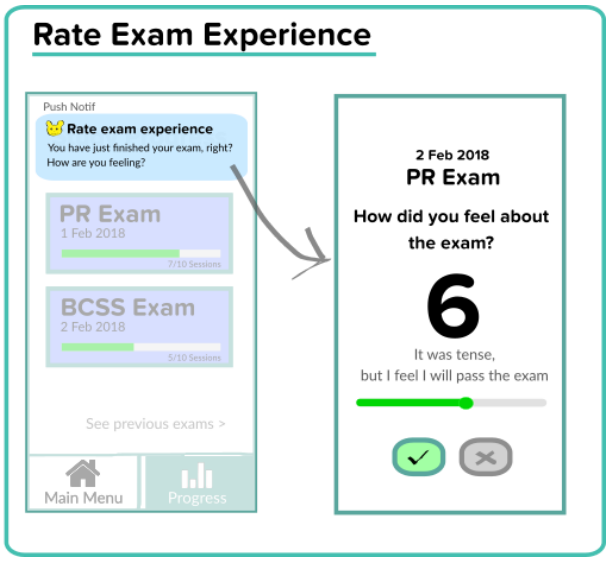
Study Progress & Rate Exam Experience

These flow for seeing the study progress are additional flow that is not a main feature for our app, but as an extension to enhance the user's experience to feel rewarded as they can see their progress of their study. The study progress is simply illustrated as a progress bar which will be full if the user finishes their study session of all materials covered in the exam.

Another additional flow would be when a user finishes an exam. The app will ask how is the user feeling after going through the exam. The user will then can rate their post exam feeling in the scale of 1 to 10. This rating will be shown in the "exam history" section as another motivation boost for the user.

The user interface for both of the study progress flow and exam experience rating flow is illustrated in the following figure.





Correlation with Action Funnel

To further explain how we tried to make the apps appearance as effective as possible we explain the design in regards to the action funnel. The action funnel is an imaginary funnel through which a user has to go to achieve the target behaviour. Inside the funnel there are several stages at which the user can choose to quit the app, thus not achieving the target behaviour.

Cue

Besides the initial launch of the app, the app has several ways to cue the user. After initialisation the app helps the user to maintain a daily schedule which will help the user improve their anxiety issues. Whenever a task is scheduled the app will send a notification, prompting the user to act.

Reaction

When the user notices the cue there two ways in which he can respond. He can either do the scheduled task, or postpone it to sometime later. We try to keep the cue subtle, so we do not provoke a negative reaction from the user. Cueing too often or in the wrong way may cause the user to delete the app entirely.

Evaluation

The time at which the user wishes to do his assignments can be picked by the user, using the scheduler. This way we try to turn the user behaviour of regularly doing the tasks performed on the scheduler into a habit. Using the “tip of the day” feature we can remind the user of his personal. This way we try to influence the way in which the user evaluates himself during his test performance. Furthermore we want to give the user a lot of features. However we want to avoid cost overload. Therefore a lot of features can also be skipped or ignored and it is always clear where the user is expected to take an action.

Ability

We try to make the User Interface as clear as possible. Since the activities/tasks are mainly about improving yourself, there is no real way of doing it wrong. After a test the app asks the user to evaluate the his/her performance in the test. Of course this can again be skipped, but if the evaluation notices frustration during a certain type of test, the user is then asked for other means by which he/she can tell the app about the test performance.

Timing

Timely notifications are provided to the user based on their study schedule. The user also gets a periodical motivational quote to help him/her build on self confidence and get the motivation to take up the test.

EVALUATION

This is the final section and will evaluate out “Exam Anxiety” product. We have given our feedback about out application, the plan for continuation and the stakeholder analysis which describes who will benefit from our product usage and experience a complete anxious free exam day.

Evaluation of the Product

We are sure that our application is implementable and quite effective for the students to come out of their anxiety issues. The application has right triggers and rewards to make it fun and comfortable for the students of TU Delft. The students as well as the university will benefit by making the students use our application. This may result in the university having more students applying for masters and PHd positions, as they will be able to manage their study schedule easily, face more exams without anxiety and understand the concept better within the provided timelines. This in-turn leads the students to come up with cool idea during their projects and assignments as they are out of exam anxiety stress and they can think better. This domino effect will benefit both university and the student. The students who don’t follow the application’s remainders and study schedule may end up quitting the university degree because they are not able to cope up with study pressure. This report has all the features of our application described well and how the problem of exam anxiety is tackled well. The aspect that can be considered for improvement would be to network the progress of the honours students that can pose as internal trigger for the undermotivated students. Additionally the teaching assistants and students who have already finished studying the syllabus assigned can help their peers understand the concept when they reach out. This would be helpful as the professors cannot be available to clarify doubts all the time and the peer help and motivation can reduce exam anxiety. The honor students and the students who have benefitted from this application can promote it between students who are to give resits.

Plan for Continuation

This concept of reducing exam anxiety can become a real life application if the university decides to accept to integrate it along with the time table application or the pulse application. Alternatively the professors can suggest this application to the students. The game has features of appreciating the students on their progress that makes them happy.

Stakeholders Analysis

This Stakeholder Analysis will give us an idea of who are interested and who are not interested in using the application and whether it will influence the students who use it. The students who have used the application will want others friends and students to benefit and will suggest it to them. This makes it clear whether or not it is worth to implement.

CONCLUSION

Exam Anxiety in student community is a toxic behaviour which is a serious problem. Our motivation in this report was to understand how this anxious behaviour affects the study life experience of the students of TU Delft and what steps we could take to counter this unhealthy behaviour and give a happy and anxious free student life experience. After much consideration and study we have come up with strategies to change the anxious behaviour and we have selected relevant target behaviour and the target group.

Initially in section 2 we have analysed the target behaviour, the behavioural plan and the conceptual design. In the next session we have extensively designed our user interface of our application and in the final section we have given the evaluation of our Exam Anxiety application and the stakeholder analysis. In conclusion, the study of behaviour change support systems, that brings effective and good changes in the people who utilise it, we feel that the application of ours will bring good improvement in the student life of TU Delft.

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ATTRIBUTION

Some icons that are used in the Customer Experience Map were downloaded from Noun Project (https://thenounproject.com/) and created by Aenne Brielmann and Hea Poh Lin.