

CareMe

A Case Study of
Interface Design Process
of a Gamified System

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2015

Abstract

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This thesis focuses on improving the user interface of an educational game named CareMe. CareMe is used to teach nurses and nursing students theory and decision making in nursing. The purpose of this thesis is to give a view of interface design process and tools in lean software development environment. This thesis will follow one cycle of development where individual parts of the user interface are improved to better serve the users.

In the development process, various methods were used from the fields of design research, game design and interface design. The problems in user interface were determined with user studies that included user narration and focus group interviews. These problems were solved by employing user knowledge, interface design methodology and gamification. New user interface elements were then illustrated in drawing software.

The result of this thesis consists of new user interface elements and layouts for the CareMe game. These elements and layouts address problems the users had in problem definition phase. A programmer can use these elements and layouts to build the interface in the game.

The interface choices made in this thesis will be ultimately evaluated in future user study sessions with nurses and nursing students and by providing feedback from the first pilot customers of healthcare industry.

Tiivistelmä

Helsinki Metropolia Ammattikorkeakoulu

Tutkinto: Muotoilijan AMK

Koulutusohjelma: Muotoilu

Suuntautumisvaihtoehto: Teollinen muotoilu

Nimi: CareMe - Esimerkkitapaus pelillistetyn systeemin käyttöliittymäsuunnittelusta

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Ohjaajat: Juha Ainoa, Ville-Matti Vilkkä

Vuosi: 2015

Sivumäärä: 60

Tämä opinnäytetyö keskittyy CareMe nimisen koulutuspelein käyttöliittymän kehittämiseen. CareMe on sairaanhoitajille ja sairaanhoito-opiskelijoille suunnattu peli, jossa harjoitellaan sairaanhoidon teoriaa ja päätöksentekoa. Opinnäytetyön tarkoituksena on antaa kuva siitä, mitä käyttöliittymäsuunnittelu on ketterässä ohjelmistokehitysympäristössä ja minkälaisia työkaluja suunnittelussa voidaan hyödyntää. Opinnäytetyössä käsitellään yksi kehityssykli, missä käyttöliittymän yksittäisiä elementtejä suunnitellaan uusiksi niin, että ne palvelisivat paremmin käyttäjiä.

Kehitysprosessissa käytetään eri käytäntöjä muotoilututkimuksen, pelisuunnittelun ja käyttöliittymäsuunnittelun aloilta. Käsiteltävät ongelmat käyttöliittymässä määriteltiin käyttäjätutkimuksen avulla. Tiedonkeruumenetelminä käytettiin vapaamuotoisia ryhmäkeskusteluja ja käyttäjien ääneen ajattelua pelatessa. Nämä ilmenneet ongelmat pelin käyttöliittymässä ratkaistiin käyttäen kerättyä käyttäjätietoa, sekä hyödyntäen käyttöliittymäsuunnittelun ja pelillistämisen keinoja. Uudet käyttöliittymäelementit kuvitettiin piirustusohjelmistoilla.

Tämän opinnäytetyön lopputuloksena on uusia graafisia elementtejä käyttöliittymään ja kuvat jotka kertovat sommittelun. Nämä elementit ja suunnitelmat vastaavat ongelmiin, joita nousi esiin käyttäjätutkimuksissa. Näiden uusien elementtien ja sommitelmien avulla ohjelmoija voi rakentaa ja realisoida käyttöliittymän.

Tässä opinnäytetyössä esitellyt käyttöliittymä-ratkaisut tullaan arvioimaan lopullisesti tulevissa käyttäjätutkimuksissa ja palautteessa ensimmäisiltä hoitoala pilottiasiakkailta.

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INTRODUCTION

Objective
Project background
Tools & methodology

Objective

This thesis will explore different tools and methods that can be used in interface design with practical examples. The scope of this thesis will be one cycle of development where individual parts of the user interface are improved based on design research findings and using methods from game design and interface design.

The objective is to address issues found with design research methods and by doing so facilitating easier use for the interface, making it more engaging and better serve its purpose as a part of educational nursing game. The end result of this thesis will be new user interface layouts, and 2D graphical elements that the programmer can use to execute the interface.

This thesis starts with providing project background information and showcasing the different methods and tools that are going to be used. From September of 2014 to the summer of 2015 I interviewed and tested the game prototype in 21 groups of 10-20 people of health care professionals and nursing students. Used research methods include user narration and focus group interviews. The game evolved during this period through fast cycles of lean software development, but when you keep going at fast cycles, bigger changes and overhauls are difficult to carry out, and some user comments stay unresolved.

In the summer of 2015, I stopped the frequent user studies and later in the summer the whole team started working on completely renewed version of the game. I had collected a vast amount of user feedback and we had already reacted to most of the issues, but a lot of changes had been too time consuming to make and also long overdue.

From the user study findings, I distilled three different user stories to solve. The whole game was reprogrammed, and a lot of user management tools were being added, and therefore, it was a good time to create new functionality and polish the user interface elements. I solved these user stories based on different principles and practices I had learned while studying at Metropolia and working as an interface designer. Lastly, I will present some of the finalized layouts of the game reviews and 2D elements of the interface. These layouts and pictures with a correct format are essential for the programmer to be able to build the design in the game. Exporting these images is the final step of my process. Subsequently, the circle closes and the process starts over again, and again...

Project background

Jaana-Maija Koivisto, a nursing simulation lecturer at Metropolia first had the idea for a gamified nursing game. Koivisto had seen how students during traditional lectures had a hard time focusing, and at home she would see her children completely engaged in tablet and pc games keeping an intensive focus for long periods of time.

CareMe started as a Helsinki Metropolia University of Applied Sciences health technology unit project in late 2012. After some ideation and pondering, Medictes Ltd was hired to develop the very first prototype of the game. The idea was to create a game that provides a safe environment to practice the whole care pathway. This would create new ways to practice wherever students wanted to.

“Previously nursing students of Metropolia practiced patient scenarios with making pen and paper scenarios, pen and paper treatment plans, participating in skill labs (manual skills) and from 2010 onwards on high definition simulations with interactive physical patient manikins” (Koivisto 2015.)

In the spring of 2014, CareMe was ready for testing but was really incomplete and the scenarios were nearly impossible to clear without crashing the game. In the summer of 2014, Sampo Nurmentaus (project manager at Metropolias research and development unit Electria) was asked to hire a game development team from the students of Metropolia to work on the game for six months starting from September.

Tuomas Louhelainen was hired as a programmer, Anna-Saida Koskiluoma as a 3D-modeller and animator and Saku Nylund (author) as a design researcher and interface designer. Peppi Hiidenkari was also helping with the early design and user studies. Together with Jaana-Maija Koivisto we formed a team that decided to start the game from scratch based on what we could learn from the failures and successes of Medictes Ltd's CareMe. There project received funding in two phases totaling one year of development time.

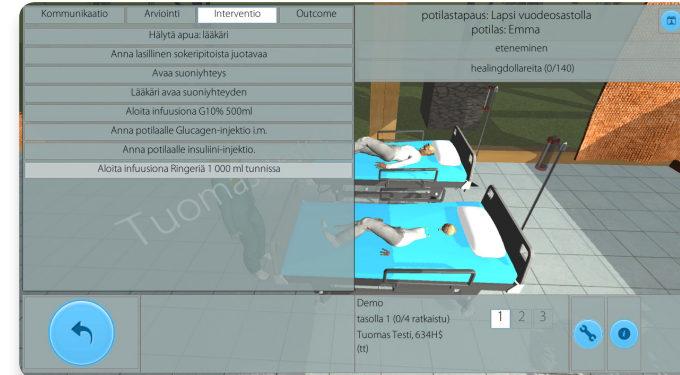
Introduction/ Project background

At first, the whole CareMe team had to understand what the aim of teaching was. The world of nursing was very strange for a designer, a programmer and for a 3D-artist. We started to develop the very first patient scenario with Töölö hospital. At our workshops, we asked the nurses to choose a good patient scenario and to lay down the choices nurses make step by step, including some common missteps. This gave us the foundation for the game mechanics.

The idea of the gameplay is to practice the care pathway through the patient scenarios. Players need to make decisions in patient care, right choices help the patient and wrong choices lead to negative consequences. The game needed to be fully customizable so that the educators could prepare their own content. This restriction came from the earlier virtual patient simulator project where Jaana-Maija Koivisto had noticed that the biggest problem with the nursing games was that the practices in nursing were very different from country to country and even from hospital to hospital. Many nursing games had content which was valid only in a small region.



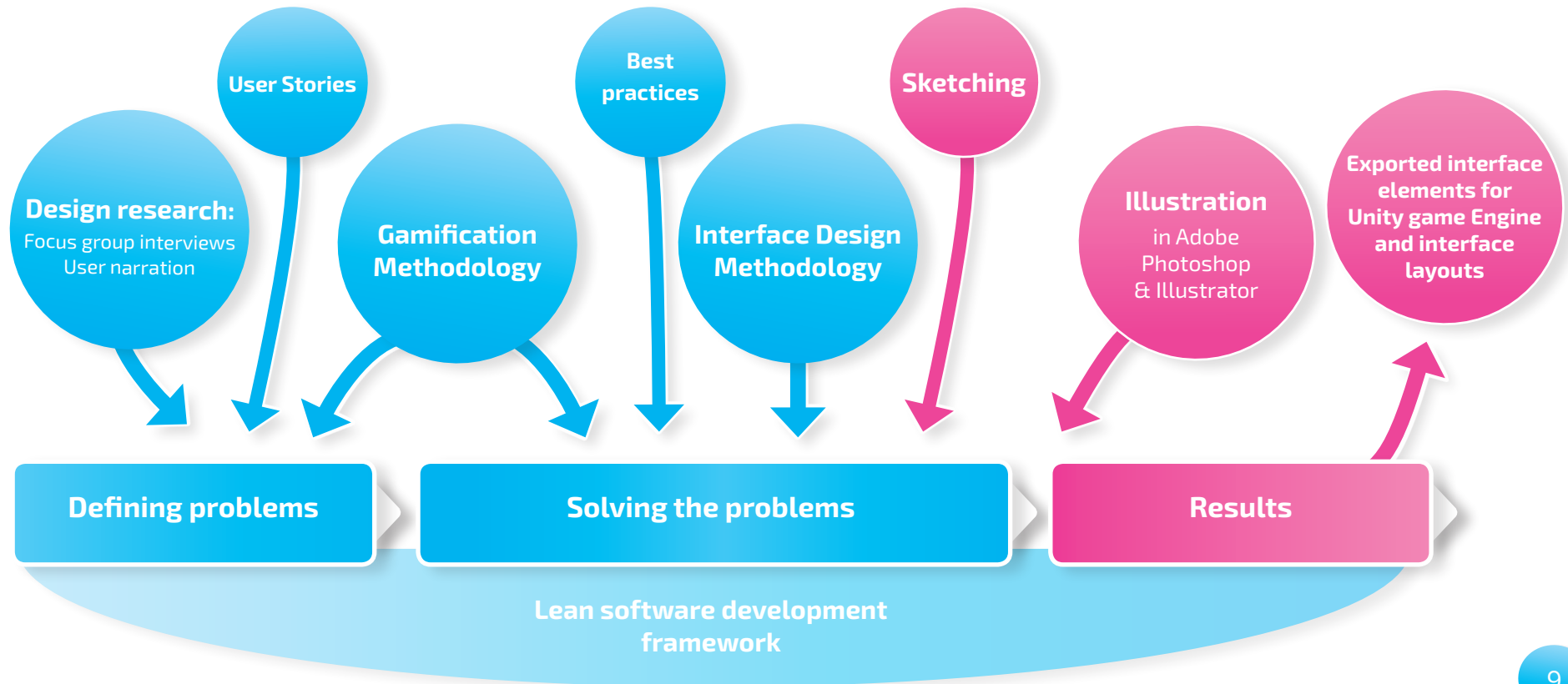
Mapping the care pathway with post-it notes with Töölö Hospital personnel. Photo by Peppi Hiidenkari



Medictes Ltd's CareMe prototype for Metropolia. Screen capture of the gameplay by Tuomas Louhelainen

Tools & terminology

In order to understand the methods presented in this thesis, some methodology needs to be explained.



One of the very central practices our team was set to adapt, was to lean software development. The original lean principles came from the world of car manufacturing. Toyota had used these principles to make their cars produced in small quantity to be able to compete with mass produced cars. (Poppendieck 2003, 1.) The CareMe team was in a similar situation, developing a game with a small team that should compete with products of big software and game companies.

In lean software development, the focus is on figuring out what the user really wants as soon as possible, and to eliminate everything else as a “waste”. Lean software principles stress the importance of quick prototyping, user studying and quick development cycles. This helps to reduce costs and increases the speed the team can address issues, thus creating better user experience. (Poppendieck 2003) In the case of CareMe, this meant that we tried to have user study sessions as often as possible, and have only little development time in between.

In the beginning of our project, the new team members were more or less clueless with their knowledge of nursing and this game’s target group. It wouldn’t make sense that a designer, programmer and 3D artist would try to develop products for nurses without understanding the users.

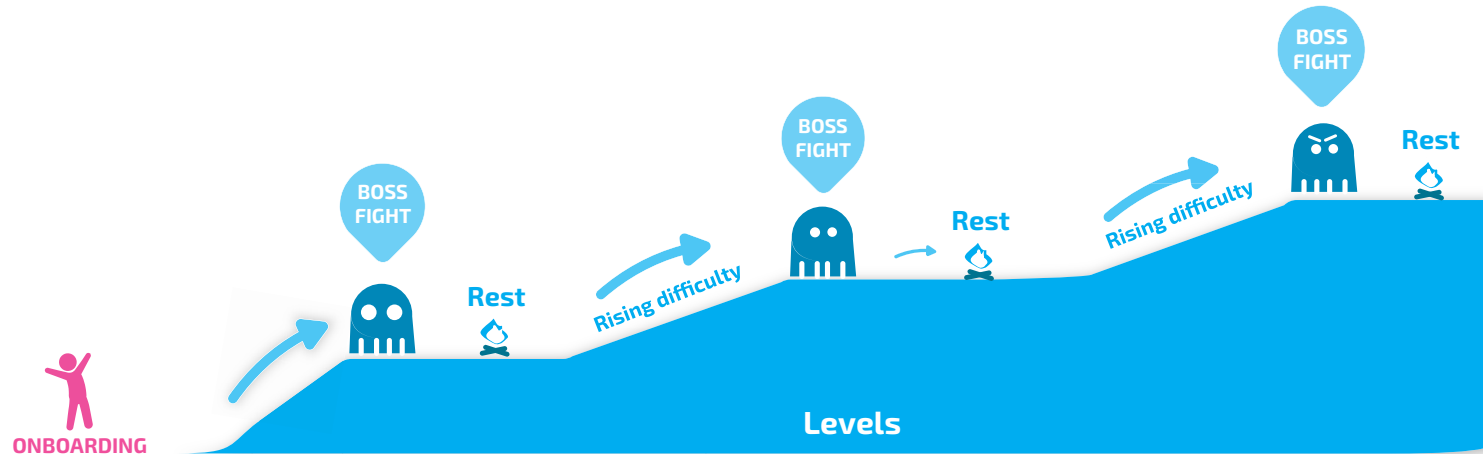
We needed to maximize our learning from the users and prototype features without spending too much time on them before we knew more precisely what they needed to be. This is why the CareMe had still a few unsolved issues and an unfinished looking user interface. It seems like that when you proceed in fast development cycles you do not have time to react to all of the feedback and have only little time to prototype.



Lean Principles:

1. Eliminate waste
2. Amplify learning
3. Decide as late as possible
4. Deliver as fast as possible
5. Empower the team
6. Build integrity in
7. See the whole

The progressive stairs model



CareMe is a teaching tool that has the form of a game, so gamification methodology ties strongly into the development process. Gamification is a term that is sometimes used of taking aspects that are boring and turning them into a game that is more fun and engaging. (Werbach & Hunter 2012, 17.) Gamification methodology provides useful tools when making the user experience more engaging, and also provides useful guidance for the interface design. Gamification is mainly a game design framework. Game design by definition is the process of creating the content and rules for a game. For the design to be good, the designer has to create motivating goals that can be reached, and rules to follow that create meaningful decisions for the player to pursue the goals. (Brathwaite & Schreiber 2009, 2.)

Gamification methods used in this thesis include engagement loop, namely series of events that create user engagement while playing a game, and progressive stairs model, namely creating dynamics in the difficulty and intensity of the game to create larger scale player engagement. (Werbach & Hunter 2012, 106-109.) Because the team did not have a dedicated game designer, my tasks overlapped with some game design tasks like designing the feedback mechanisms. My game design knowledge in the start of the CareMe project was limited only to making my own board games when I was 10 years old.

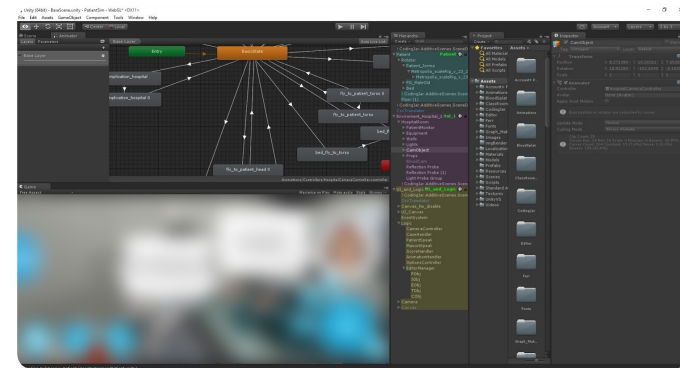
In the user studying phase, design research methods are used. These methods include user narration, focus group interviews and analyzing and processing the findings. The main task of design research is not to study what exists but to find out what ought to be. This makes design research different from traditional scientific research and useful for designing. (Milton & Rodgers 2013, 11.) I had prior experience of planning and executing user studies from school projects at Metropolia. Using audio equipment for recording users narration and conversations was not a problem because I had gained prior experience as a sound engineer at Savoy Theater's stage at Espa.

In the problem solving phase, I will also be using different principles of good interface design. One of these is Nielsen Norman Group's Ten usability heuristics. (Nielsen 2005) I will also be using methodology from different user interface designers and researchers. My experience of user interface design was limited in the beginning of CareMe project but started growing quickly.

Best practices include methodology widely used in different fields, and it can be used to benefit the user interface design as well. The idea of best practices is that often there is no need to do extensive research when the best solutions can be already found from other products. The wanted functionality would be benchmarked and then the most successful features are used as a building base, onto which one could develop further in order to be better than the competition. (Andersen, Hiebeler & Kelly 2000, 20.) I will be using this methodology loosely in this thesis when designing smaller details of the interface. I have used this methodology before working as a designer in a project called VitalSens where I benchmarked and mapped the different features of mobile ECG-monitoring systems.

Introduction/ Tools & terminology

The game is being developed in Unity game engine. All of the user interface improvements will be built inside? Unity by Tuomas Louhelainen from layouts and graphical elements produced in this thesis. The concepts have to be designed in a way that makes their production in Unity possible and economical. To execute the interface design elements to the use of unity I use Adobe Illustrator, which is vector based drawing program, and Photoshop, which is a photo editing software. I had plenty of prior experience using these drawing software from school projects and from work as an Industrial Designer at Shakes bkk (a design studio). The whole CareMe team used google drive, a cloud storage and office tools solution, to exchange material and to monitor project progress.



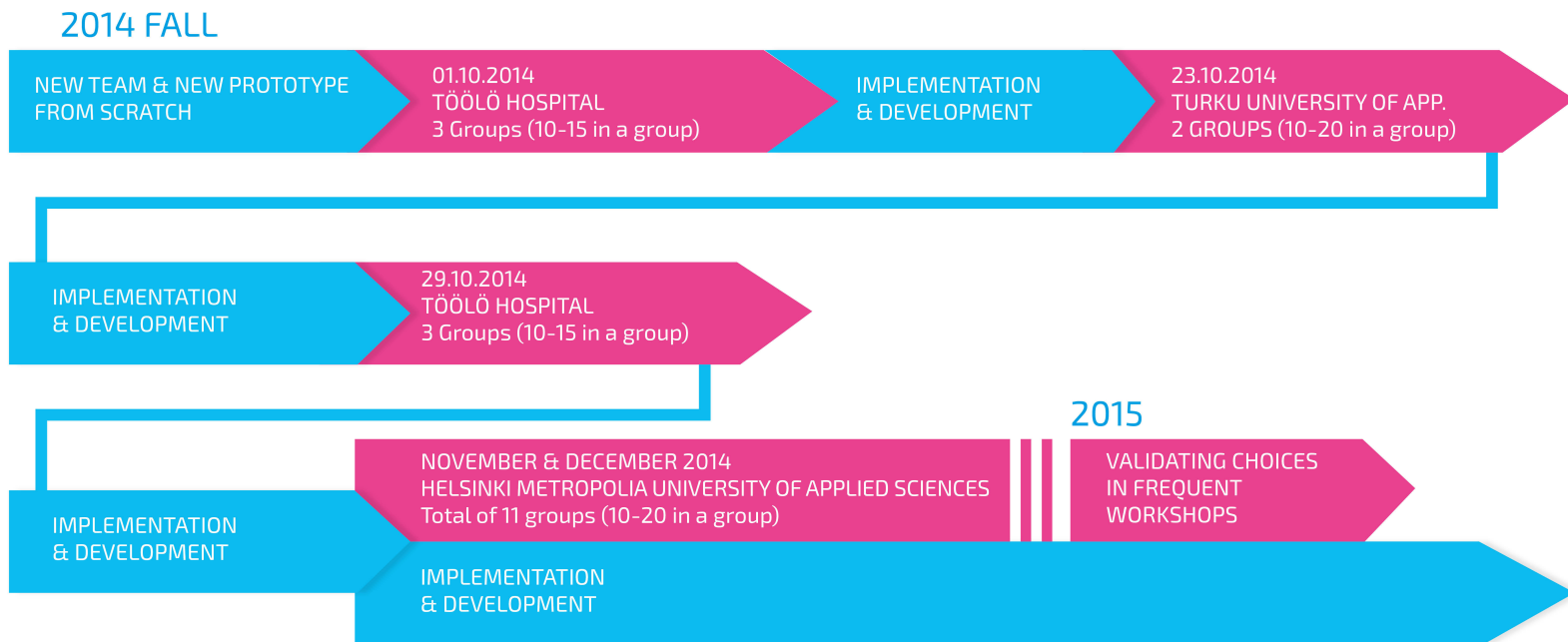
*Unity game engine, game view blurred because confidentiality.
Screen capture by Tuomas Louhelainen*



DESIGN RESEARCH

- Time frame
- User narration
- Focus group interviews
- Analyzing findings

Time frame



CareMe design research sessions timeframe, one group of people = one session



User narration

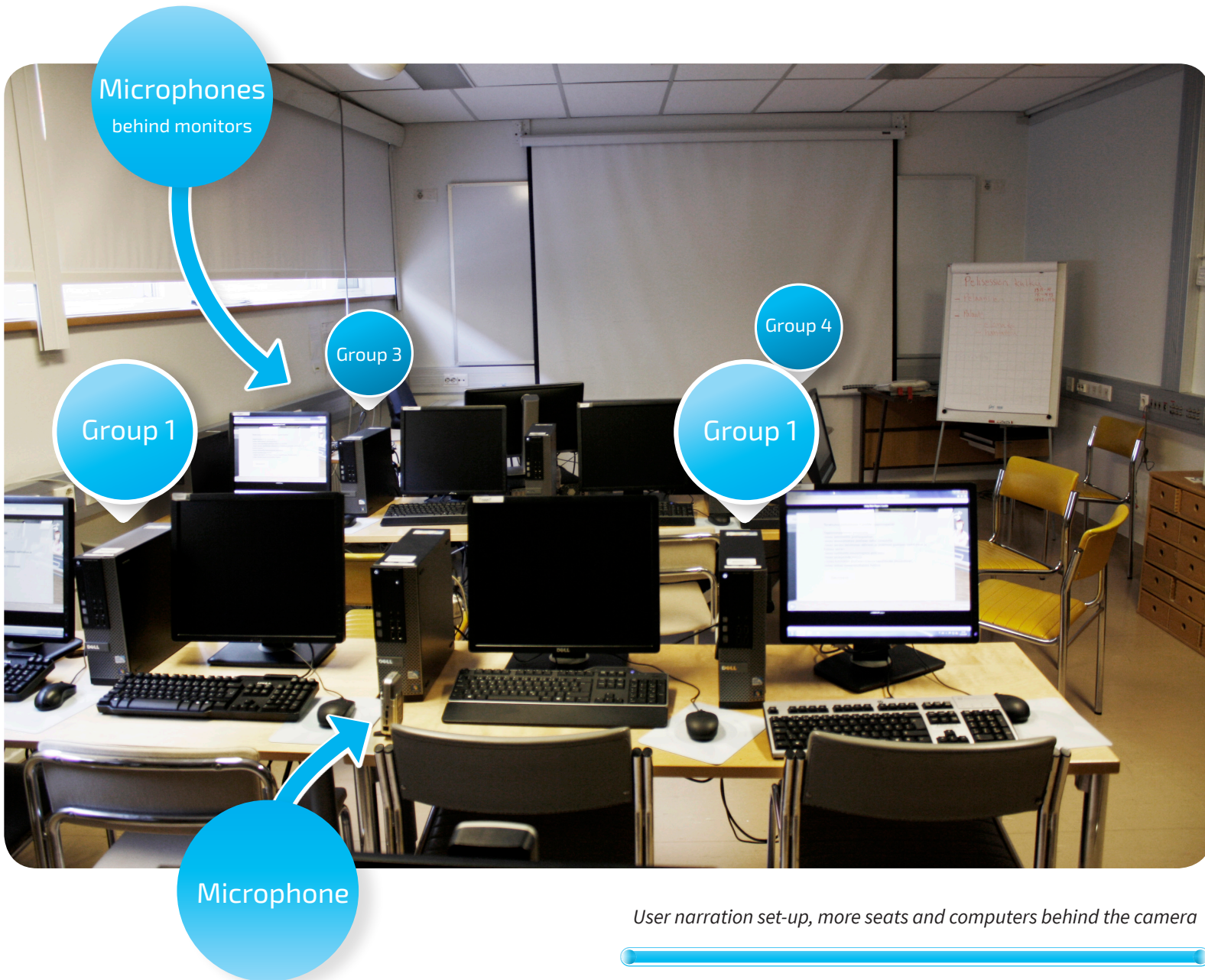
We had a total of eight user study sessions with user narration and focus group interviews in Töölö hospital with professional nurses and Turku University of Applied Sciences with nursing students. After Turku and Töölö sessions, we had eleven sessions at Metropolia University of Applied Sciences with nursing students but only a few sessions of those eleven included in user narration, focus group interviews and documentation.

The remaining Metropolia sessions consisted mainly of classes where students were playing the game and giving oral feedback to the CareMe team members (usually two present, at least me and Jaana-Maija) and we saw how the game works in practice and collected bugs (programming errors) to fix. We had these undocumented sessions partly because we also suspected it was a good way to open the minds of nurses and nursing students to the idea that playing a game could actually be a fun way to learn. At the end of the sessions, well over hundred people had played the game.

User narration is a method, where the users think out loud when they are using a product. The users are asked to describe their actions and thinking them out loud. This is a great method for collecting the users' desires, concerns and motivations when using the product. (Milton & Rodgers 2013, 71.)

A typical session consisted of two parts. First, we asked the participants to go sit by the computers in pairs of two. Then Jaana-Maija Koivisto (who always was present at study sessions) told who we (a lot of times other team members were assisting us) are and why we are conducting the study. Subsequently, I told everybody I would record their speaking during the game play. I continued to state the purpose of learning and how even the harshest criticism would be welcome and that the participants should not be afraid to speak freely, or even to use curse words if they felt like it. I noticed that the participants seemed to give more honest feedback when this was stressed.

We knew it was hard to have people narrating their thoughts through the gameplay because, it tends to make you feel awkward and stupid. We solved this quite successfully by advising the participants to form groups of two to three with familiar persons. Moreover, they were asked to narrate the game play to each other. I also found out that this seemed highly effective to capture moments when the user was lost and not realizing his or her options, in such situations participants regularly asked each other questions about what to do next. Sometimes you miss these situations because you can't see the interface in audio recordings and thus I walked among players and made notes of the difficulties with the UI. The playing and narrating sessions lasted from 20 to 40 minutes, there was not a lot of content in the game at this stage.



User narration set-up, more seats and computers behind the camera



*User narration at Turku University of Applied Sciences
Photo by Peppi Hiidenkari*

Focus group interviews

In the second part of the study sessions, we asked the participants to stop playing the game and to form groups of 6 to 8 people. The idea was to have non-formal discussions about the game and its problems in the form of a focus group interview. Focus group interviews capitalize on the communication between the participants. The group discusses the loosely structured agenda which generates ideas and thus understanding of the issues. The idea is to let the conversation flow freely without much moderation, so that the idea generation and understanding from the users would be maximized.

However, to keep the conversation beneficial and on the right tracks, prompts are used. Prompts are small questions to direct the discussion. When choosing these questions, it is really important to not to make leading questions like “Did the playing feel like fun?” but rather more neutral questions like “How did the playing feel like?” so that the user would not be directed to answer in a certain way.

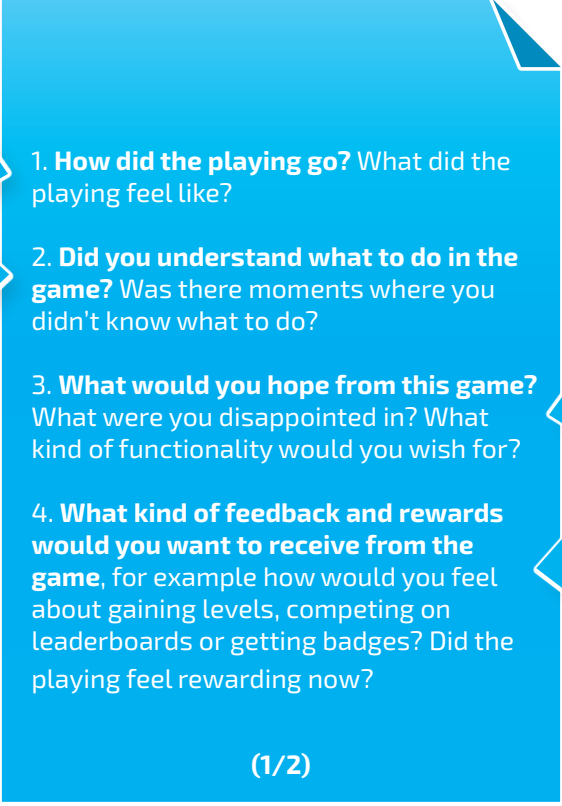
(Milton & Rodgers 2013, 70.)

I had prepared a list of topics and prompts to discuss. The discussions were recorded and later analyzed by categorizing comments on different topics ranging from usability issues to pedagogy. The topics and prompts changed with small modifications from test to test. I was usually the one to prepare them. In each step I asked only one question first and the follow-up questions (prompts) of the same topic followed when the interviewees ran out of things to say.

On the next page I will show one example of my session questions and topics for Metropolia’s nursing students, this was one of the last focus group interviews I conducted roughly translated from Finnish to English.

This first topic was an icebreaker to start the discussion. This was a good way to have the participants open up. This question also made the interviewees able to tell their topmost feelings and opinions about the game. One unresolved comment from these topics was that the students felt like they are bad at nursing when playing the game.

In order to do engaging gamified systems it was really important that our engagement loops worked. If the player did not have enough motivation for the next action, the loop would be broken. This motivation can mean anything from the visual cues in the interface to the feedback they gained from performing actions. If the player did not have the right motivation from the game they would feel lost at what to do. The whole purpose of this topic was to find out the situations where we needed to create better motivation for the players. (Werbach & Hunter 2012, 108.)

- 
1. **How did the playing go?** What did the playing feel like?
 2. **Did you understand what to do in the game?** Was there moments where you didn't know what to do?
 3. **What would you hope from this game?** What were you disappointed in? What kind of functionality would you wish for?
 4. **What kind of feedback and rewards would you want to receive from the game,** for example how would you feel about gaining levels, competing on leaderboards or getting badges? Did the playing feel rewarding now?

(1/2)

This question comes partly from lean software development principle “build integrity in”. (Poppendieck 2003, 1.) We wanted that the game would exceed the expectations for the game. We also wanted to know where the players were let down. I found out that this was also a great way to collect ideas for new features. The players commented in the conversations for example that they wanted more information and explanations about actions in the game.

I chose this topic because I wanted to make sure that the software was gamified enough. I was also wondering should we introduce some new motivators like badges. Badges are for example one way to gamify the experience and motivate the players. (Werbach & Hunter 2012, 106.) Concerning, these topics, I heard generally a strong argumentation against badges and leaderboards from the nursing students and heard comments like that they want to compete with only themselves.

It was my task to design and draw the facilitator character and decide how did the character inform the player. It was important to make sure that the players understood the character's function and role and learned to seek for information from him / her. This question was key to develop the facilitator in the right direction. This question revealed that the users were not sure of the facilitator's function at first, and that they did not have time to read the longer comments. The users did not know that you could click the facilitator to show the text again.

The first part of the question is mainly designed to define the features the users described in the context of learning. From this, we could find out what features to develop further and which ones to ditch as a waste. Finding out the features the user did not need or use was essential for following the very first lean principle: eliminate waste. The last prompt was asked to create feature ideas, but also to produce useful knowledge that the users want to read longer explanation texts if they are provided and have more guidance in the game.

5. How did you perceive the facilitator character that was on the side giving comments? Was her role clear? How did you react to her comments and did you read them all?

6. How would you describe your learning while playing? Did you feel like you learned something new playing these scenarios? How could we help you learn better?

7. What aspects in the game created difficulties for you?

8. Did you receive enough feedback? What kind of statistics would you wish to have from your playing / learning?

(2/2)

This question defined a lot of usability issues. Some of the comments that came from this question include too quickly disappearing texts and not knowing what to do next in a scenario.

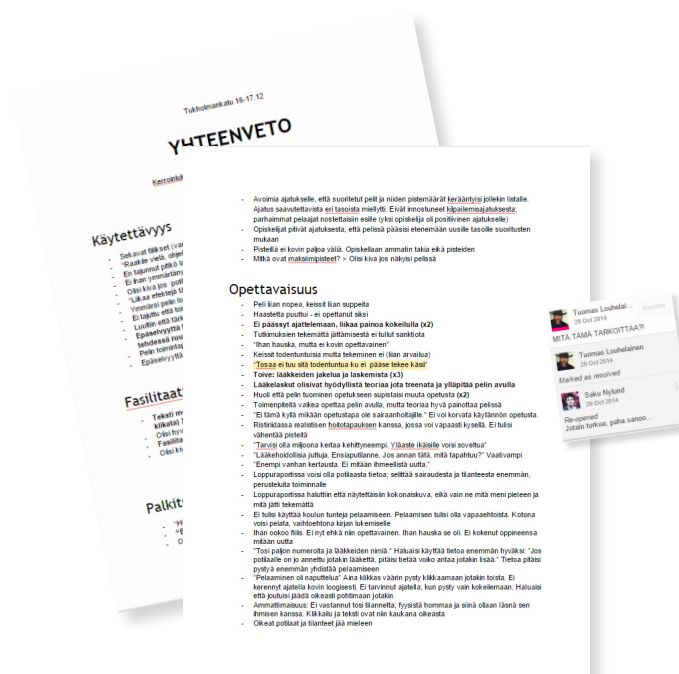
This question was saved for last because then users had time to think different aspects of the games before discussing the feedback they would want from the scenario. These questions were fishing for ideas for functionality of the games end report. The discussions helped to determine what kind of information was useful and which was waste. One of the common comments was that they want more explanations and that it would be useful to see the whole scenario executed/ carried out in the right

Analyzing findings

After the user study sessions were over, I started to listen to the gameplay commentary and the focus group interviews. When I heard a comment that was relevant for the game development, I wrote it down.

These relevant comments were categorized under the following topics of: usability issues, game design, visual style and animations, comments about the feedback system (facilitator, and about the role of the player), engagement (reward systems), scenarios, and pedagogy. Some of these categories were intended for the use of other team members, for example pedagogy and scenarios were mainly aimed at Jaana-Maija who was working on the educational content. Usability issues, feedback systems and engagement seemed to include the most of the useful information for me.

Then I went through notes taken during the test and wrote down my own observations to the end of the comment summary. These observations were mainly about smaller problems that the users did not address, like minor programming bugs (for example animation was not played right). These observations seemed to support aspects that the users were already saying in the user narrations or focus group interviews, and added little to the interface design.



Examples of comment summary pages and comments on Google Drive

If I encountered a comment that was mentioned before with similar or slightly different wording, I marked the number of occurrences behind the comment and made its font bolder. This helped when going through the summaries to prioritize comments. The summaries of the user study sessions (attachment 1) were shared in Google Drive to all team members so that everybody could use the insight about the users and make notes and write comments to other team members. As a designer, I felt that this was a very easy way for me to communicate the user research findings to other team members and thus have more issues addressed outside of the interface design. For example, some animations of the patient reactions were adjusted and programming errors fixed based on the user comments.

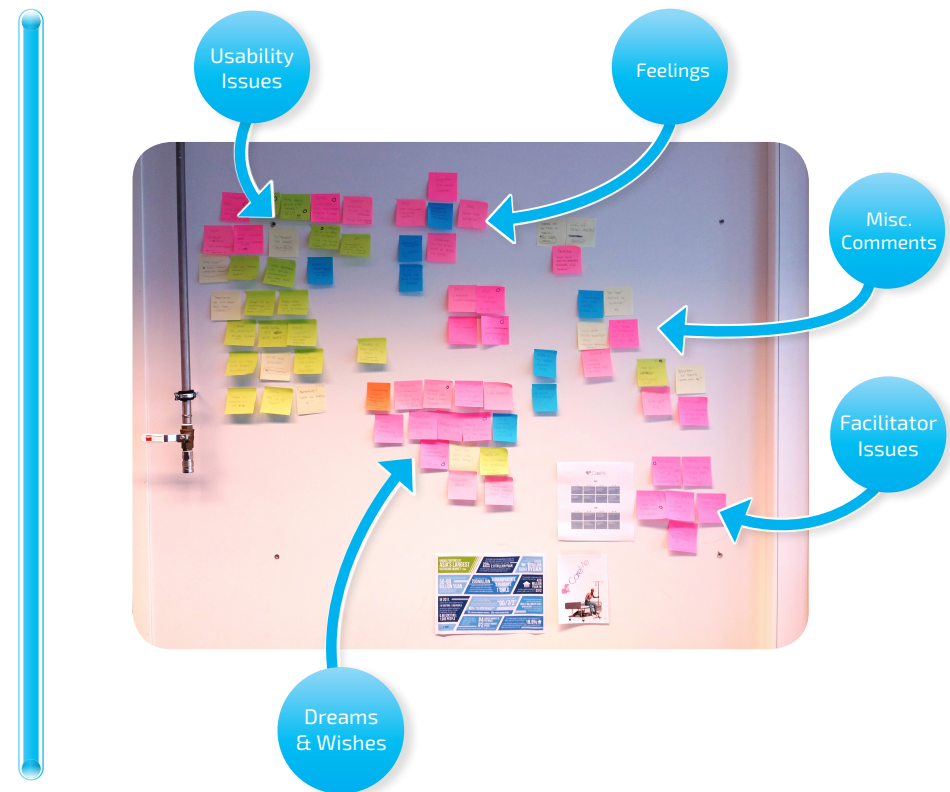
I learned as a designer that it is very useful to share the gained user knowledge with the whole development team. I strongly suspect that a lot of game and software companies would benefit from user knowledge that was produced by design research and communicated to programmers, game designers and 3D-artists so that they can make better decisions.

I later found out that contemporary agile software development team members are encouraged to share knowledge and to work outside of a fixed job description to be more productive. (Layton 2012, 91.) I strongly recommend this approach, as I have seen it work so well. For example, Tuomas Louhelainen created visual effects to the user interface that would have taken ages to produce in 2D elements.

Design research/ Analyzing findings

I started to pick recurring comments about the user interface related issues and wrote them down on separate post-it notes. I then roughly arranged the post-it notes in groups that related together. In one corner, there was usability issues that needed to be solved, for example too transparent a menu window that made reading of the menu text difficult. In the center, there was dreams and wishes with features that could be added e.g. giving more explanations to the users. In the section discussing feelings, there were for example comments of feeling like a bad nurse because the game feedback was too harsh. A big group also formed around the issues of the game facilitator character and its feedback.

I prioritized the comments to address based on occurrences (reformulate the sentence, the meaning is not conveyed to the reader) I started solving problems based on the design intuition I had gained. Designer's intuition is often overlooked as a powerful evaluation method of what kinds of solutions could be created. (Milton & Rodgers 2013, 142.) The changes made after a set of the user study session were always validated in the following session.





USER INTERFACE DEVELOPMENT

User stories
Solution to user story #1
Solution to user story #2
Solution to user story #3

User stories

After one year of development, the prototype had evolved to a game that had the essential functionality in and most critical issues addressed. The wall with the post-it notes still had plenty of unresolved user comments. From unresolved comments, I took the ones that were most recurring and from them the ones that intuitively felt like good choices for the user stories that could be solved by making changes in the interface.

User stories are short descriptions of wanted functionality from the perspective of the user. These stories distill the essential information from user needs in a sentence that can be used as a task brief. The user story formula goes: As a (type of user), I want (users goal), so that (reason the user has for the goal.) (Ambler 2014.) From the research data, I could see three major comment groups that needed to be reacted to. I chose to translate them as user stories that would set concrete goals for the improvements of the user interface.



User interface development/ User stories

*"Oh, at first I was lost but after a while
I got a hang of it"*

(heard in eight conversations)

On many user comments, the interviewees mentioned that at first they felt at lost concerning what to do. These users often stressed in the focus group interviews, that they have not played games before and do not seem to understand them. We figured that this problem would be solved with the release of tutorial level that would have detailed instructions on how to play the game. But for me, it also meant that the user did not have good enough motivation to choose the first action.

I realized that these users rarely seemed to notice the interview, examine and procedure buttons. Usually in the scenarios after patient information is displayed, the player should press the interview, examine or procedure buttons that bring out more detailed choices on top of the icons. The users were not sure where to click to start the game after the patient information.

I tried to distill all these observations in this to a one user story:

User story #1

"As a nurse / nursing student who does not play a lot of games, I want to understand where to click so that I can start playing"

User interface development/ User stories

*"I do not have enough time
to read the comments!"*

(heard in sixteen conversations)

The users didn't realize they could press the facilitator character/ button the have the information show again. In the complication game mode, some users seemed to panic and have difficulty reading all the feedback they got. On the other hand, even though we had increased the explanations of wrong and right actions in the scenarios, a lot of users were still demanding more information for each step. One user comment of this was:

"I want more explanations!"

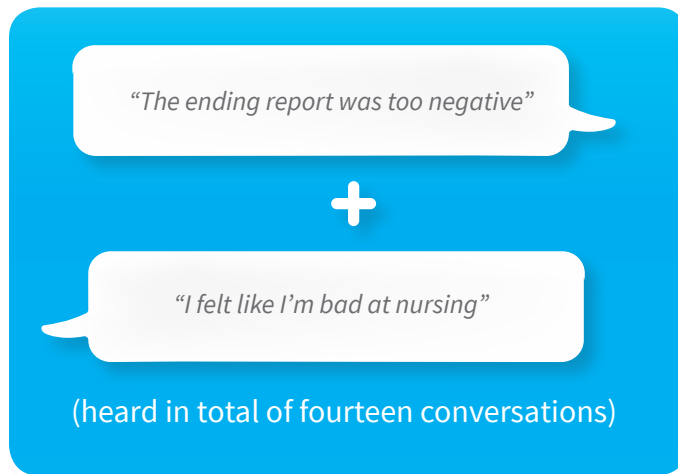
(heard fifteen conversations)

As a user story, the sentence would resemble this:

User story #2

**"As a nursing student /
nurse I want to have as
much explanations as
possible and have the time
to read them so that I can
learn more efficiently"**

User interface development/ User stories



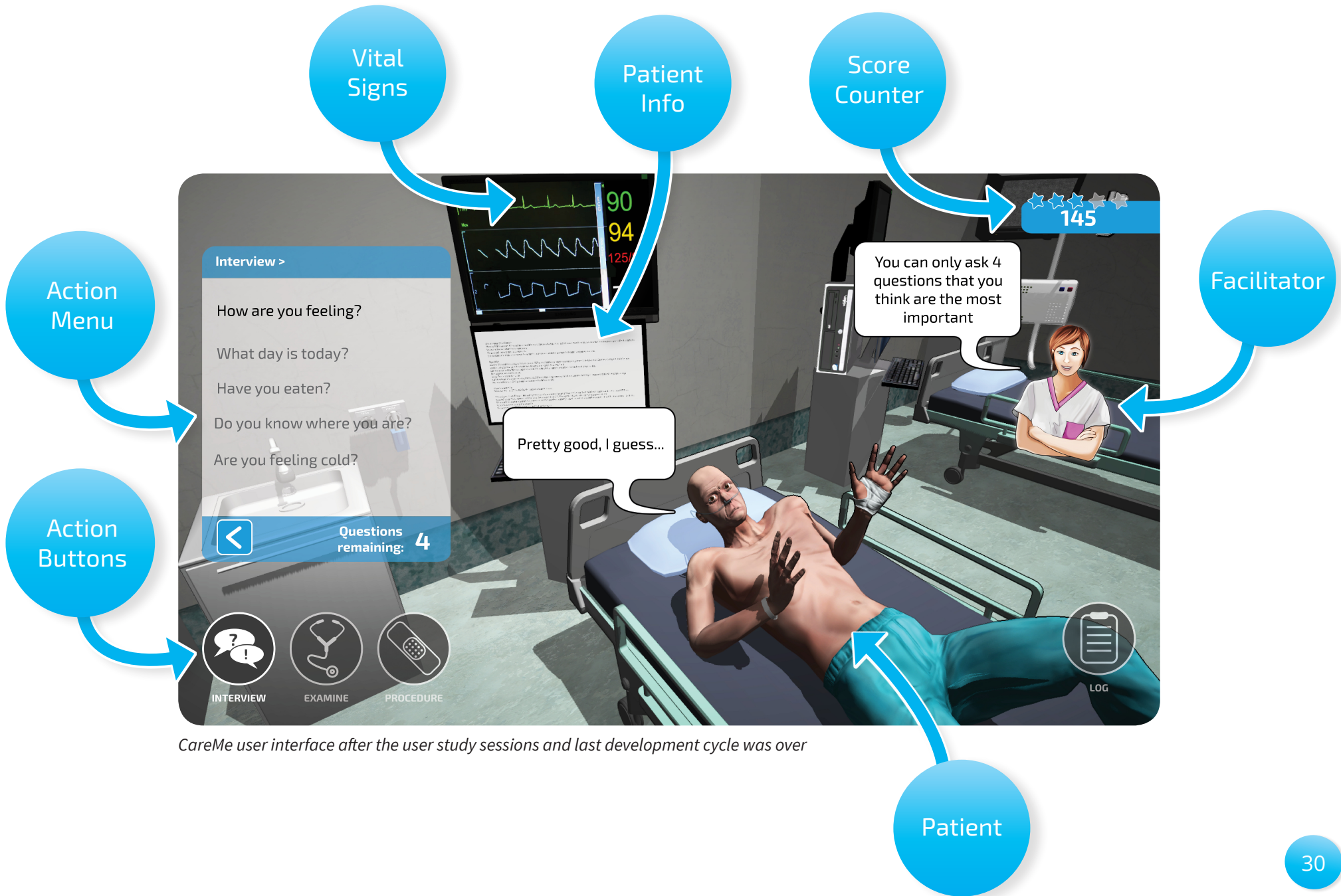
When a scenario finishes, the rest of the period, which is supposed to be motivating and supporting, gave the players only their score points, stars from zero to five and also the players were informed where the mistakes were made. I figured this is why a plenty of users had said that they did not feel very motivated during the first time playing a scenario.

Another unresolved issue consisted of the score calculator being too small and the players rarely seemed to look at it. But after they knew their first star rating, the majority of users seemed to become motivated to try to beat it.

In later tests that were not user narrated, I heard a lot of students ask each other what star rating they had had. However, some of them commented that they really did not follow their scoring during gameplay and the rating came off as surprise in the end. The score counter needed redesigning and the end report had to be improved to make it more motivating and informative.

From previous observations and user comments, I created the following user story:

User story #3
**"As a nursing student / nurse
I want to get encouragement
and to know how to be
better at the scenarios so that
I can enjoy the game and learn
more efficiently"**



CareMe user interface after the user study sessions and last development cycle was over

Solution to user story #1



The current icons for the interview, examination and procedure did not invite any clicking at first for users who were not familiar with games. I suspected that the gray and slightly transparent icons seemed inactive and uninviting. The buttons needed to look more like buttons. They should give strong feedback when the mouse cursor hovers over so that the user knows that the button can be pressed.



Old icons, when the cursor is on top of option the icon loses transparency

I tried to look for best practices in games that were marked "casual" in google play store's top games section, because they had the focus on inexperienced players. Casual games are games that have easy rules, are quick to learn and can be played in little time. (Sliwinski 2009.) I distilled the characteristics of these game buttons and combined them to create a feature list for the new buttons.

User interface development/ Solution to user story #1




Clash of Clans
(Supercell 2013)


- Glossy
- Drop shadow
- White border




Angry Birds 2
(Rovio 2015)

- Bright color
- Thin border
- Slightly glossy




Trials Frontier
(RedLynx 2014)

- Bounce animation
- Glow

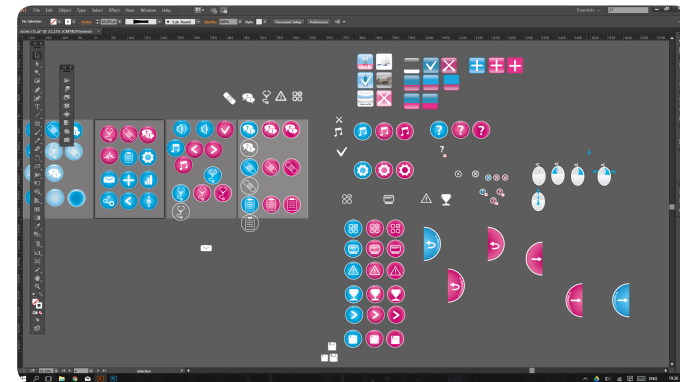
New CareMe Buttons

- Glossy
- Animated if player inactive
- Bright color
- Thin border

User interface development/ Solution to user story #1

A Web designer Pete Orme says in his “principles for successful button design” guide that buttons need enough contrast from the rest of the content. Orme advises to try to use color, size, whitespace and typography to make sure the buttons stand out. (Orme, 2013.) The size, whitespace or typography were not the problem but I had to acquire some color variation to my buttons.

The user does not really think about deeply which icon/button to press in the screen, they just rapidly scan the interface and try the first thing that seems “good enough” for the action. (Tidwell 2015, 11.) This means that when the user first scans the game view, the buttons should pop out of the view and seem like the first things to try. I tried to make the buttons bright and to make them look like physical buttons so that the function would be as clear as possible and they would rise from the background. These characteristics went well with the best practices feature list.



Game icons in Adobe Illustrator



New icons

User interface development/ Solution to user story #1

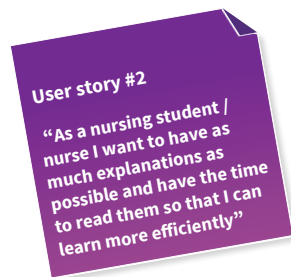
In button design, one should always make sure that during all the stages, the button can be represented. Users usually have a visual model concerning how the button should work based on their experiences with real world buttons. (Orme 2013.) My buttons could be at default state, under the mouse hover or pressed down (which causes the action options menu to show). Therefore, I had to make variations of the button to represent these states.

For added contrast from the background, I also gave the programmer instructions that if the player does not click anywhere in the beginning, after a short while (10 seconds) the icons start to bounce thus stealing the attention of the lost player.



When an icon is clicked it presses down to give the user feedback that the game registered the click

Solution to user story #2



CareMe's facilitator character that gives additional information, gives explanations and tells examination results

There were a few problems with the game facilitator. First, it did not read as a clickable object to players. It needed to relate to the other buttons of the game. Second, the speech bubble was not very effective in delivering longer explanations. If a text did not fit the bubble, it would appear in segments that were 15 seconds apart.

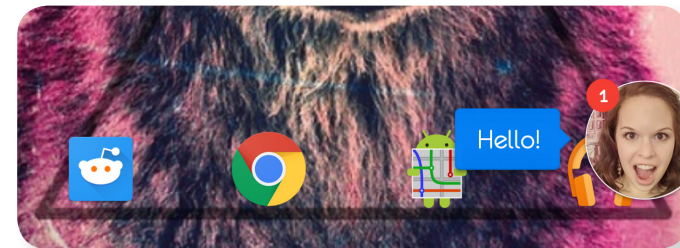
The first problem was easier to solve. All I had to do is to redesign the graphical element of the facilitator so that it would group to the other icon buttons that the player could click. Jakob Nielsen is regarded as one of the leading user experience experts, and one of his major usability heuristics principle is “consistency and standards.” This means that user should not need to wonder does similar looking icons work the same way in different situations. (Nielsen 2005.) The facilitator for example is supposed to read as a button similar to other buttons that open content, for example the interview buttons brings up the interview choices panel and pressing it again closes it. All the clickable UI elements should relate so that the user understands they work in similar ways, e.g. when you click them, you will have additional information or options.

User interface development/ Solution to user story #2

The other UI buttons were circular and had a white border, and therefore, the facilitator element should have a similar shape and border. The facilitator character icon should also be positioned and work in a way that the players have been used to in other interfaces that have similar functionality. An attempt was made to find out what kinds of interfaces our target group uses and went for the popular smartphone apps. In June of 2015, the Facebook messenger app had over 700, 000, 000 active users worldwide (Statista 2015) and when I checked from the google play store (in 15.11.2015) it was the fourth most popular app in Finland. I had seen our users use Facebook after playing the game and heard a few Facebook messenger app notification sounds in the tests, the chances were that a lot of our users were used to this application.

In Facebook messenger, when a user receives a message from a friend, a circular floating head that you can move around appears on top of smartphone's operating system. This feature has been well accepted and companies like Google have been later implementing similar approach in their own messaging apps. (Petrovan 2014.)

The beginning of the message would show a speech bubble and by clicking the icon, you could view the whole conversation. This was essentially what our facilitator was set to do, and thus it would make sense that it would work the same way as Facebook's one in order to follow the Nilsens "consistency and standards" principle.

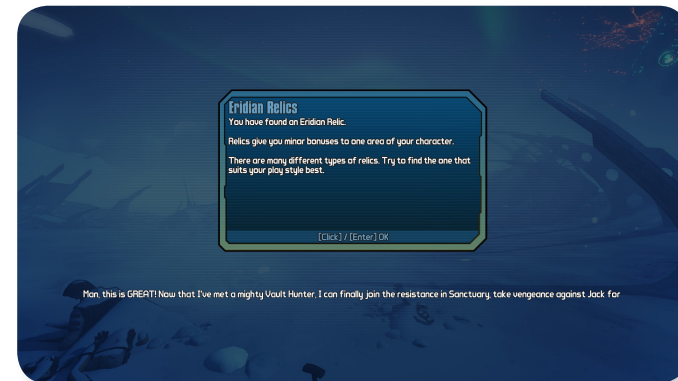


*Facebook Messengers floating head active on
Android smartphone home screen*

User interface development/ Solution to user story #2

The players had plenty to look at concerning the game view, the patient that reacts to choices, the points, the stars, feedback in the choice menu (the chosen right answer turns green and the wrong answer turns red) and the comment of the facilitator. However, the legendary computer scientist and interaction designer Ben Shneiderman reminds in one of his eight golden rules of interface design to always try to reduce short-term memory load. The idea of this is that humans have a limited information processing capacity with their short term-memory and you should try not to overwhelm it. If the user needs to remember information from one screen to another, he or she has to use short-term memory capacity on remembering that information. (Shneiderman 2015.)

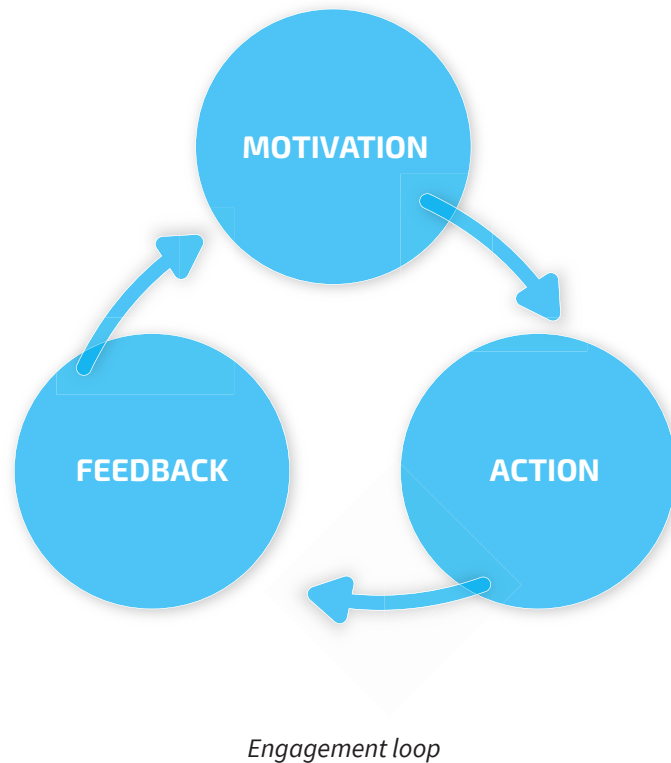
All this information shown on game view adds stress to the short-term memory. If the user's attention would like to be drawn towards the facilitator's comments, other information should not be on display at the same time and all movement should stop. I tried to think of examples from games and realized that many games had solved this problem by pausing the game and showing a pop-up window where the information is presented. These pop-ups usually have "OK" or close buttons. The Facebook messenger also takes over the whole screen when the whole conversation is wanted to be seen.



*Information pop-up in Borderlands 2 (2K Games 2012)
The game pauses, game view goes darker so less detail is shown and the attention focuses to the information*

Also implementing Shneiderman's principle of reducing short-term memory load, the users would need to see decision defining information from the facilitator at the same time they are choosing an action. This means that parts of the facilitator's comments shown on pop-up window (that have to do with future actions) should also be shown on the speech bubble. This enables the user to view the information at the same view where he or she chooses the next action. The longer explanations that have also tips for next actions were tricky in the small speech bubble format but if only the essential information for next actions would be shown, this would not present a problem.

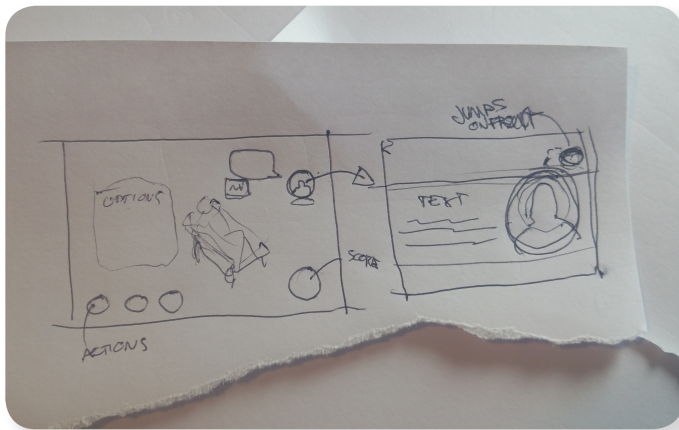
User interface development/ Solution to user story #2



The facilitator's comments should also try to give maximal motivation for choosing the next action creating an engagement loop. The basic component of gamified systems are engagement loops. These repeating patterns help to engage players to the games. (Werbach & Hunter 2012, 106.) I realized the short text that explained the previous action did not create much motivation for the next action.

A conclusion could be drawn that we should offer a possibility to build scenarios so that the facilitator could give more complete explanations about the made choice in the pop-up format and after the user closes the popup, a different shorter text related to the next action could be shown (i.e. small tip), creating an engagement loop.

User interface development/ Solution to user story #2



Early ideation sketch that shows roughly the functionality and layout I want to create

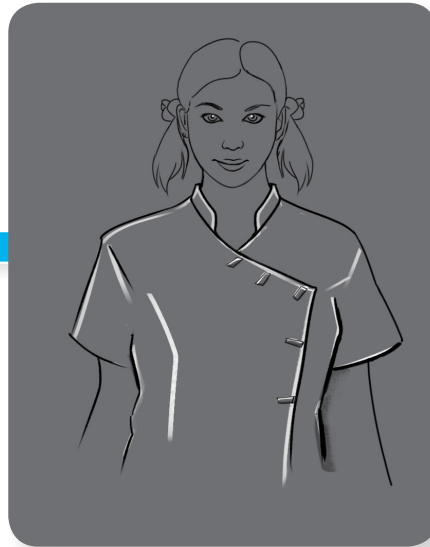
We had agreed earlier with the team's 3D artist Anna-Saida Koskiluoma that the game should have a somewhat serious and realistic visual style so that the game feels trustworthy without feeling completely like a software rather than a game. We felt that Arthrogame, a French educational game for the pharmacists, had the best practices concerning the right balance between realism and stylization. We went after finding a similar balance. This would define my following sketches for the facilitator.



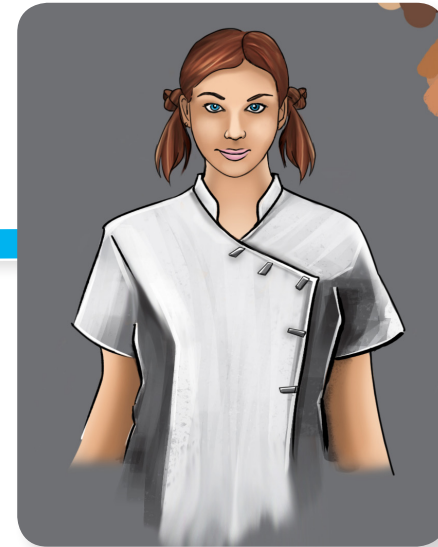
Screen capture from Arthrogame



Rough sketch in Adobe Photoshop



Linework that was drawn on top of the rough sketch



Coloring the new facilitator



Finished facilitator drawing

User interface development/ Solution to user story #2

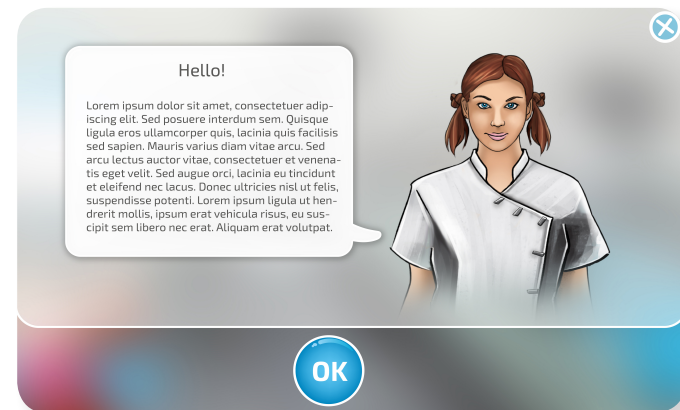
Now that I had drawn the facilitator, it was time to make it relate to the other buttons that you could click. I used the same base as had been used for the icons and created a facilitator button with the same kind of gloss, circular form and the white border. Now the facilitator looked like one could click it. I created a simple pop-up view where the facilitator could have a lot larger speech bubble and which could be closed by multiple ways, like pressing a cross on the top right corner (countless software use this placement), pressing “OK” button underneath the window, or by clicking the facilitator. When a pop-up is closed, it can be reopened by clicking the facilitators head icon, very much like in the Facebook messenger app.



Clickable buttons I had created solving the previous user story



New facilitator icon

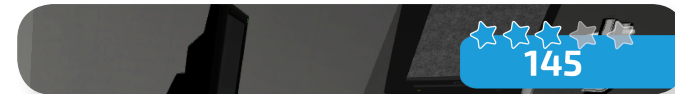


New facilitator pop-up

Solution to user story #3

User story #3
“As a nursing student / nurse I want to have encouragement and to know how to be better at the scenarios so that I can enjoy the game and learn more efficiently”

The score calculator needed more contrast so it would be noticed, and the ending report should be reworked to be more motivating and informative. By clicking on the score, the player could also end the scenario if they could not finish it or did not have time for it, so the score calculator should also read as a clickable button. I decided to take the same base I used for the game action buttons and facilitator. I also made the score counter bigger to give it additional contrast as one of the focal points of the game.



The original score counter



Different variations for the score counter

User interface development/ Solution to user story #3

Score counter states:



When the player's star rating rises the star enlarges and spins so that it would capture the player's attention. When a player loses a star, the star shrinks and spins. Also when the player has score points, the number enlarges momentarily, and when the player loses points it shrinks momentarily.

In western culture, the meanings of green and red color as indicators have rooted deeply. We all know that the color red means something negative, like do not cross the street, and that green means that something is ok, e.g. you can now cross the street. (Stone, Jarrett, Woodroffe & Minocha 2005, 251.) Because of this, the font of the rising score (right answer) was made green and the lowering score (wrong answer) was made red.

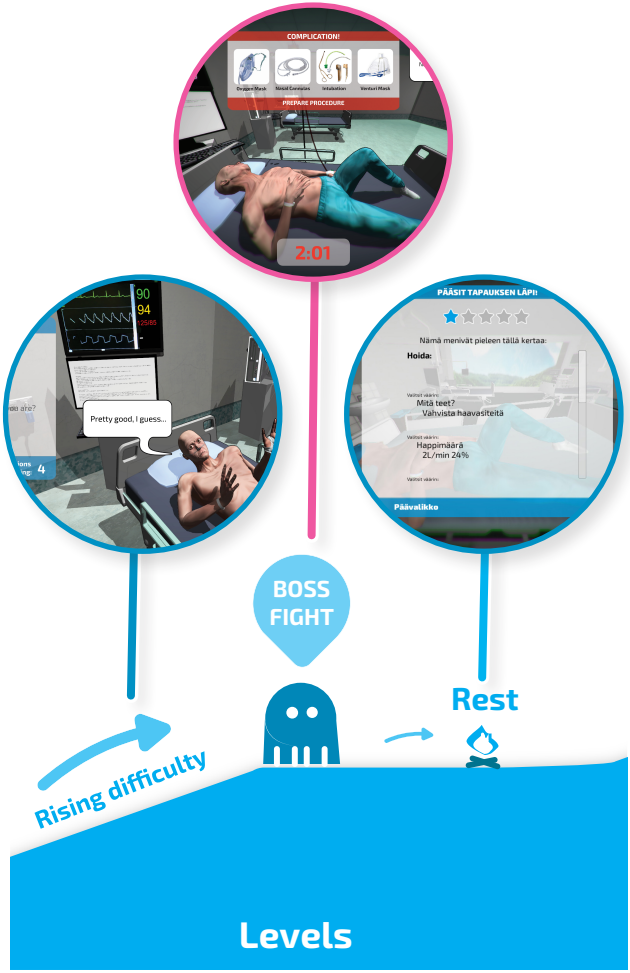
User interface development/ Solution to user story #3

In the user story, the players did not feel good about themselves in the end the scenario and this made it harder for them to engage to the game. To engage the user even more besides using engagement loops, a larger scale principle of progressive stairs can be used.

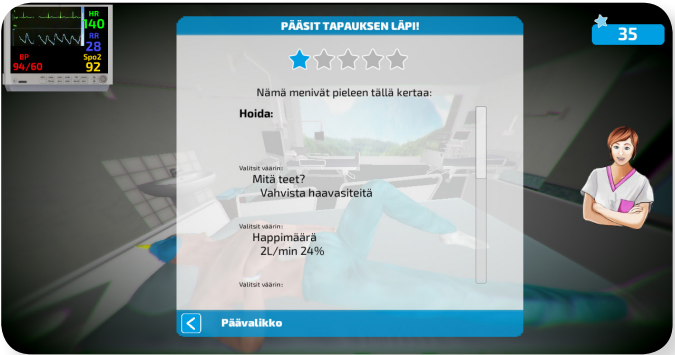
The basic idea of progressive stairs is that the difficulty should not rise steadily but with steps that create drama thus producing engagement. In the progressive stairs after the onboarding to the game (for example a tutorial level which we are to produce) the game progresses with a rising difficulty which is climaxed at a boss fight. A boss fight can be for example a very difficult enemy that you have to win. After the boss fight, the player can rest for a bit, and bathe in the glory of positive feedback. Then it is back to rising challenges and so forth. (Werbach & Hunter 2012, 106.)

In CareMe, we had implemented this model already in the complication game mode. In the world of nursing, killing epic dragons with your spells isn't useful and thus we had asked nurses to describe the most intensive and demanding situations in their work and had answers like declining vital signs of a patient. We had turned these patient complications into a game mode and to increase the difficulty, we introduced a countdown clock. If the time runs out, the player loses. In the current CareMe, these intense moments had a more pressing and alarming feeling in the visual style than in the normal game, and would usually be the last part of a scenario. The problem was that the end report came on top of the view of complication, giving it grim feeling. And in the progressive stairs model in the rest period, the user should feel at ease, feel good for finishing the boss fight (complication) and have positive feedback before playing the next scenario.

User interface development/ Solution to user story #3



CareMe's progressive stairs model implementations



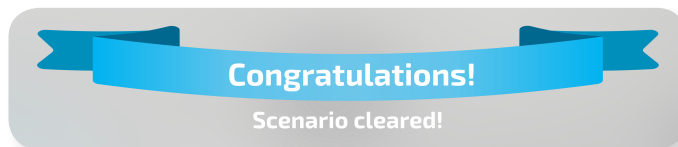
The end report that comes after clearing scenario or finishing complication. Apparently I'm not very good nurse.



Victory screen in Clash of Clans (Supercell 2013)

User interface development/ Solution to user story #3

I was set to make the scenario ending screen more supporting. I thought that the very first thing the player reads after completing the scenario should be something that makes them feel good for example a simple congratulation on top of the banner. The banner gives the text a slightly festive feeling. The game view should recover from the grim feeling of the complication view, go to regular game view and then blur to give focus to the ending screen. This way the ending screen can look less dark and pressing, and more supportive and at ease.




I had learned earlier in the user study sessions that generally our users did not want to compete, “because competing does not belong to the nursing world” (I heard this comment multiple times). Most of them felt motivation like leader boards (list of people with the highest score) would be a bad idea. I had, however, heard when players after the tests asked each other their star ratings and were eager to compare with each other.

Because of these observations, I chose to create a pie chart of the players score that also showed the average score of all the other players. This way there would not be any direct competition, but players could still compare themselves to others.



Because the users had complained in the studies that they wanted to know what to do differently next time playing the scenario, I chose to create a view that showed the right care pathway, the user performed that action right as well as the explanations and scoring.

THE RIGHT ACTION	YOUR ACTION	COMMENT & SCORE
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed posuere interdum sem.		Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed posuere interdum sem.



RESULTS

In-game user interface layouts
Facilitator pop-up
Scenario ending screen layouts

In-game user interface layout



Results/ In-game user interface layout

In the new game view, the clickable buttons have contrast from the background. If the player does not do anything in the first 15 seconds of a scenario, then the interview, examination and procedure buttons will start to bounce, drawing the focus of the user. This also indicates that they should be the first buttons to try out. The score counter is also made to look like a button because the user can end the scenario by clicking it. The counter will now have animations when player receives or loses stars or points to give better feedback from playing.

The facilitator character was redesigned in a way that it looks like an object you can click, which it is. The longer explanations were removed from the speech bubble, and only relative motivation for next action is shown, thus making the game more engaging.



Facilitator pop-up

Hello!

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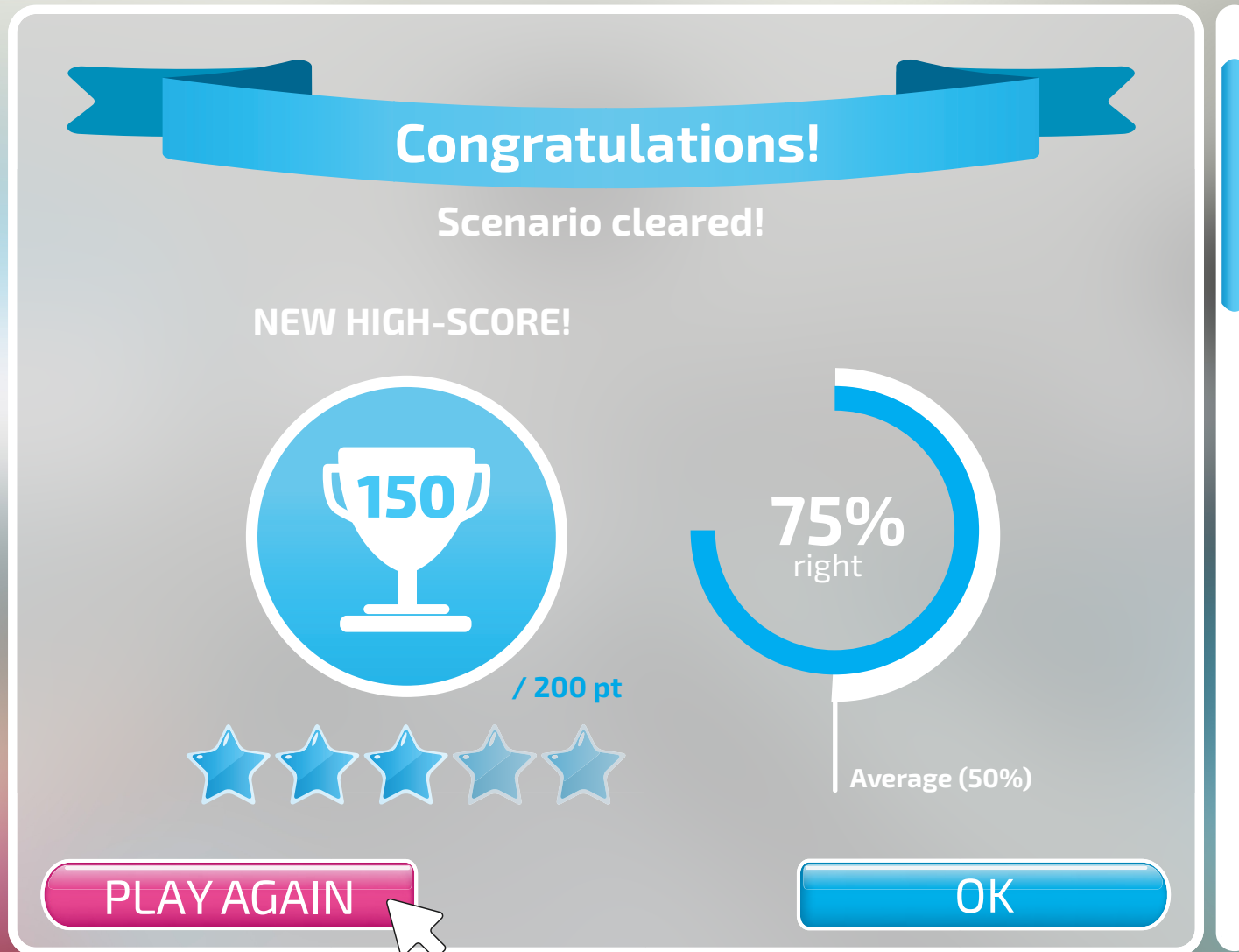
OK

Results/ Facilitator pop-up

A new feature was introduced to the game. The content creators could now write longer explanation texts in a pop-up format. When the explanations and comments about the made actions are shown separately, it does not load the short-term memory while playing and choosing future actions. Blur is added to the game view to take the focus out of all the options of the game, again conserving short-term memory and helping the players focus on reading. The information can be recalled by clicking the facilitator icon.



Scenario ending screen layouts



Results/ Scenario ending screen layouts

THE RIGHT ACTION

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed posuere interdum sem.

YOUR ACTION



COMMENT & SCORE

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed posuere interdum sem.

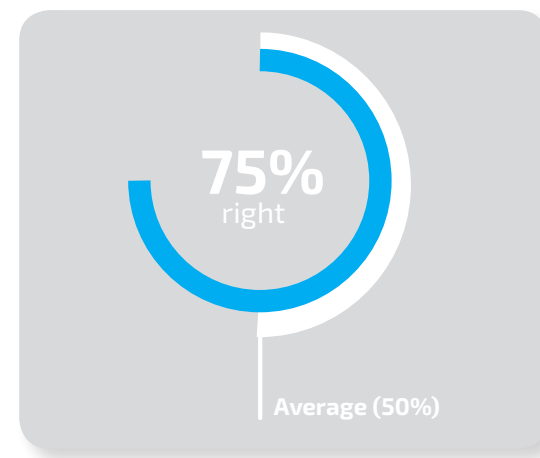
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed posuere interdum sem.



Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed posuere interdum sem.

The ending screen of scenarios (or the end report, as the CareMe team calls it), was redesigned to be more supportive. The ending screen now gives compliments and has a more uplifting feeling.

A new feature, where players can see their performance compared to others was added based on knowledge of the users. Now players can gain motivation on competing with class average without a direct competition between nursing students or nurses. The right care pathway was added to the report based on user feedback.





CONCLUSIONS

Process evaluation
Future development

Process evaluation

The design research I conducted was very fruitful for the interface design. Without it I doubt that I ever would have known what kind of features in my designs create problems for the users and what kind of functionality the users really needed.

I feel that lean software development practices can be used widely even in traditional product design. Lean thinking forces the designer to quickly prototype and not to worry about small details. The product's essence is quickly molded with user studying, and thus the end user has more influence over the final product. It is true that sometimes the customer does not know what they want, but in lean framework the new ideas can be quickly tested and evaluated. Prioritizing customer feedback does not mean that the designer should not think outside the box and use intuition when choosing which features to design. The lean methodology made it possible for me as designer not to waste time designing aspects that would not make a difference for the user. Without the fast cycles, I would have probably created a lot of unwanted functionality. It also made the game development very fast and productive. Whenever we gave game demos for other developers they were surprised how far we proceeded with the time we had.

I learned that there is no need to invent the wheel again, many times best results arise from finding out how the problem is solved elsewhere in best practices. It would be pointless to spend time and energy designing something that has already been carried out even better somewhere else. It is, however, more important to know your end user to have even some understanding on what might work for them.

I believe that industrial designers could use some of the gamification methods even outside interface design. Knowing what kind of functionality engages the user to use the product could be very beneficial on designing the interactions between users and devices. This thesis was a good learning journey for me, because I had to put together methodology from different fields more systematically.

Future development

So what happens after this? The development of CareMe was taken over by a new startup that is named Practigame, where I am co-founder. The interface choices made in this thesis will be ultimately evaluated in future user study sessions with nurses and nursing students and by feedback from the first pilot customers of the healthcare industry. Next step in our development process is validating choices in user studies, after which we analyze the findings and then go back to develop the game further until the circle starts from the beginning.



SOURCES

Interviews
Literature & web

Interviews

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A Case Study of Interface
Design Process of a Gamified System

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