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Abstract

This thesis presents the idea and implementation of a "Therapeutical Social Network" developed in cooperation with the Institute of Clinical Children and Adolescent Psychology of the University of Vienna. This platform named "MindBook" is a web application that shows children and adolescents with depression that presenting themselves in a positive way leads to more positive feedback than being negative. This application can also be used preventively. MindBook is programmed in PHP and uses HTML5, CSS, jQuery and MySQL.

Diese Arbeit zeigt die Idee und Erstellung eines "Therapeutisches Soziales Netzwerk", welches gemeinsam mit dem Institut für klinische Kinder- und Jugendpsychologie der Universität Wien entwickelt wurde. Die Plattform namens "MindBook" ist eine Webapplikation, die Kindern und Jugendlichen mit Depressionen aufzeigen soll, dass eine positive Selbstdarstellung zu positiverem Feedback führt, als eine negative Selbstdarstellung. Auch ein präventiver Einsatz der Anwendung ist möglich. MindBook ist in PHP programmiert und nutzt weiters HTML5, CSS, jQuery und MySQL.

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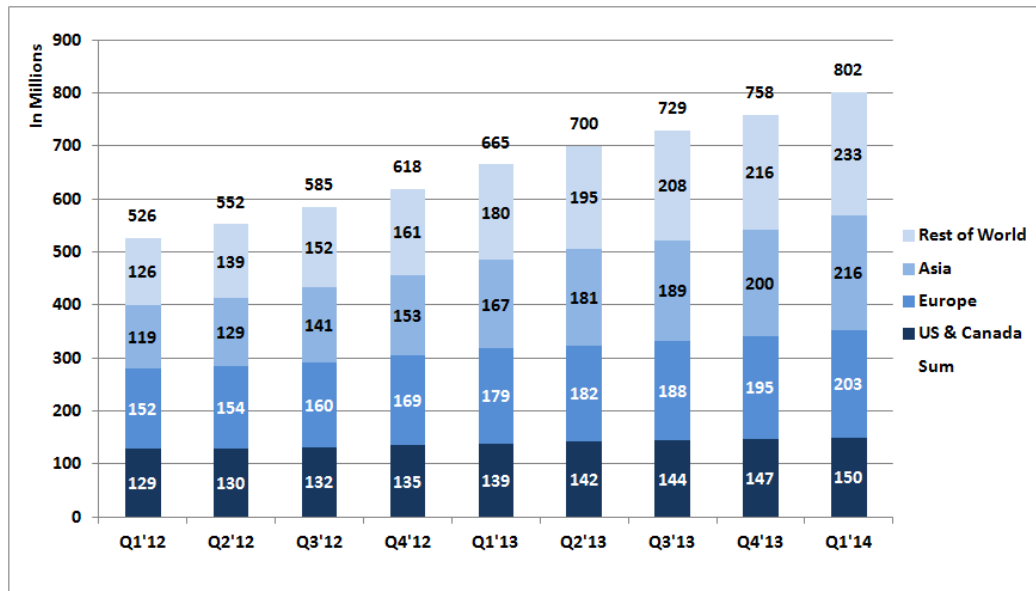
Chapter 1

Introduction

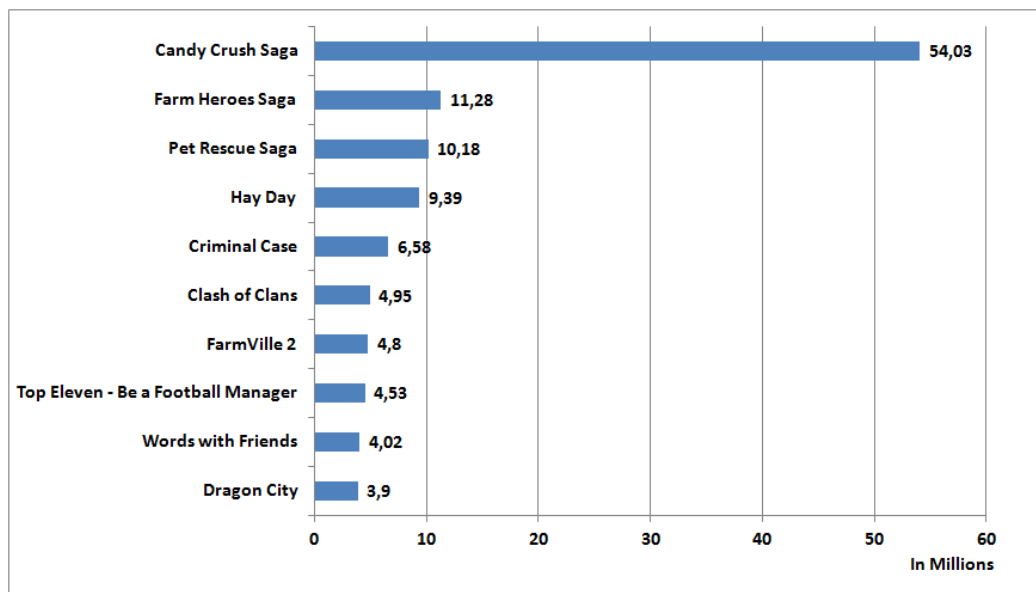
"Facebook", "Twitter", "XING" and other social networks are very familiar to us. Social networks are an integral part of our daily routines. According to Duggan and Brenner [5] about 67% of american internet users are social media users. The leading network by far is Facebook with about 699 million daily active users worldwide in second quarter 2013 (see Fig. 1.1a) [8]. In Europe the amount of daily active users remains at 182 million. The total number of people registered on Facebook is about 1.11 billion in the world, in Austria are about 44% of all internet users active on this social network at the end of 2012 [28].

Furthermore playing on social networks is very common. In April 2013 the most popular game on Facebook is daily played by 15.29 million users (see Fig. 1.1b) [11].

This excessive use of social networks - especially Facebook - and social games leads to the idea to help children learning in a playful way. The institute of clinical children and adolescent psychology of the faculty of psychology founded the idea of developing a game in the style of Facebook that trains the sense of self and shows the effects of positive self-expression in



(a) Daily active users [8]



(b) Top ten Facebook games in April 2014 [11]

Fig. 1.1: Facebook statistics

social networks to the children.

This thesis first presents the idea of the aspired therapeutical social network named "MindBook". Afterwards I give a short overview of the ideas the therapeutical social network is based upon. In this part I state what social networks in general are, what serious games are and I give a basic introduction to the psychological background. The next chapter explains the technical realization. It continues with the evaluation and the last part engages with some further improvements and ideas.

Chapter 2

The Idea of MindBook

The common use of social networks also includes children. Many children and young adolescents are very active on e.g. Facebook. This frequent usage can be enriching for the children's social lives, but there are also hidden risks. Social networks offer a broad platform for ostracism, mobbing and bullying. Children with low self-esteem could be discouraged by social exclusion and negative tendencies can be increased.

2.1 Facebookapplication or Not?

At the very beginning the psychologists and I had the idea to develop a Facebook application that pursues the goal of strengthening the children's self-esteem and to show that feedback is more positive, when the self-expression is positive in the first place. Due to multiple reasons we refused this idea and decided to develop a stand-alone web-based application to follow our goals. The reasons for the decision against a Facebook application are as follows:

- An application requires a Facebook account and cannot influence the rest of the accessible network.

- Friends can not be chosen by the therapists.
- Reaction and posts of friends can not be influenced by the therapists.
- The terms of use of Facebook prohibit the use of their social network by children aged under 13 years [10] (article 4, point 5).

It would have been possible to implement virtual friends designed and managed by therapists within the application, but despite all the possibilities within this particular part of the network, the remaining accessible parts of Facebook cannot be controlled by the therapists. This leads to the major problem that friends and their behaviour can not be influenced. Children can become targets of bullying attacks on their pin boards outside the application, relating to their images or posts. The other way around it is also possible, that children are suspended by their peers. All these possibilities would lead to unhappy feelings and narrow the self-confidence of said children.

2.2 MindBook: A Therapeutical Social Network

As a result of these considerations the idea of a "**Therapeutical Social Network**" named "**MindBook**" was born. Children should have the feeling that they are part of a social network and therefore it was important that the application's look is similar to Facebook (see Fig. 2.1). Though the functionality is different to conventional social networks, MindBook trails the same aims mentioned in the considerations about the Facebook application. Children should learn to present themselves in a positive way, and subsequently receive positive feedback from their peers.

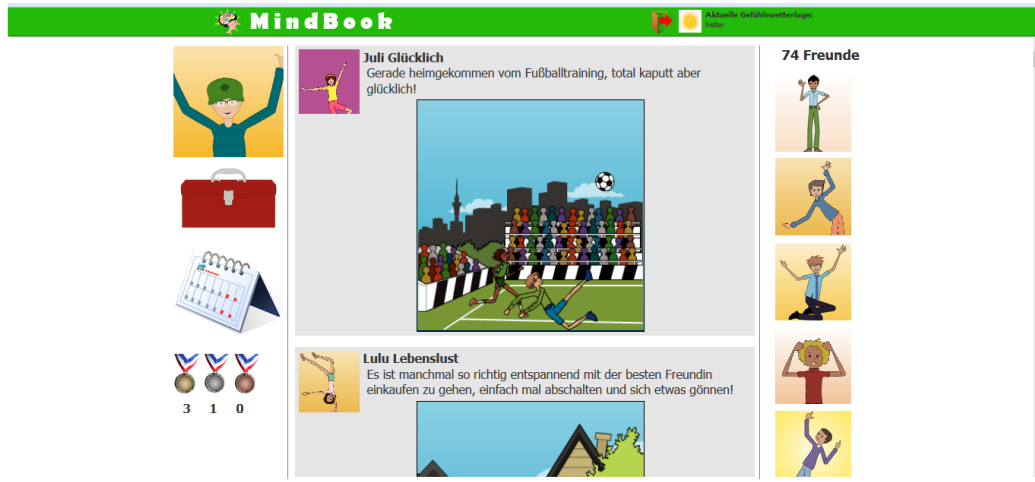


Fig. 2.1: MindBook mainpage

To achieve this goal already offline existing psychological practices (see section 3.3) were implemented in this "Therapeutical Social Network". Based on the self-portrayal of the children we want to provide feedback to the children. To avoid that children are discouraged by negative feedback of their friends we included some games and a week planner to help children structure their activities. In addition we planned a reward system for positive self-expression and completion of planned activities.

Chapter 3

Background

This chapter covers the background beginning with an overview about social networks. Furthermore I discuss the possibility to learn in a playful way and give a short introduction to the psychological background for the implementation described in this thesis.

3.1 Social Networks

The base for MindBook is the excessive use of social networks and their influence on children and adolescents. However, what are the features of social networks and why are they so popular? I will try to give an overview over the main features of social networks with the help of Facebook.

3.1.1 Short history of Facebook

Facebook in its current form was developed by Marc Zuckerberg at Harvard University in the spring of 2004 as "thefacebook" hosted under "thefacebook.com". The platform pursued the idea of a digital yearbook of the Harvard University. Therefore it was necessary to sign up with an Harvard

mail account. However soon this restriction was canceled and the network spread over the US and in the following worldwide. On December 30, 2004 Facebook accomplished the mark of one million registered users. The actual domain "www.facebook.com" was purchased for \$200.000 on August 23, 2005. In May 2012, Facebook went public, with many companies in the back that were bought over the past years. The last major take overs have been Instagram in April 2012 [29][31] and WhatsApp in February 2014 [9].

Nowadays this site provides a platform for people to present themselves in public, to their friends and colleagues all over the world.

3.1.2 Features

There are a lot of different features that make social networks interesting. Many platforms offer news on their mainpage. This can be news from friends, new job offers and so on. In case of Facebook this information are news from friends and satisfies human curiosity and attracts users to return many times a day. Of course the amount of news increases with the increasing number of friends.

Furthermore people like to share information about their own lives. This can happen in form of text entries, pictures or videos and it can be chosen with whom the entries are shared. Of course this newsfeed is not the only feature that Facebook has to offer. Additionally every user has his own profile page. This consists of different areas:

- **Timeline:** Overview about the user with his latest posts and entries where he is linked. Furthermore this area presents a brief summary about the other areas.
- **About:** Basic information, information about education and job career, relationship, family and contact information.

- **Photos:** Partitioned into three areas. The first area shows photos where the user is tagged, the second shows photos the user has posted and the last area provides the albums the user published.
- **Friends:** This area shows the users' friends.
- **More:** This point merges the rest of personal information like places, music, TV shows, films, games and so on the user likes or marks.

A further feature that animates people to come back are the possibility to play games. The number of games different developers provide on Facebook is substantial. This countless amount, many different genres to choose and the possibility to play with other people encourages users to play. Furthermore the option to share game statistics in the timeline and on friends' newsfeed encourages to play the same game repeatedly.

All these features together explain the success and popularity of Facebook and make it an ideal model for an application similar to a social network.

3.2 "Learning in a playful way"

It is no secret that learning in a playful way is very effective and motivating. This fact provoked the development of games that aim primarily to a learning effect instead of fun. The first who described this idea was Clark C. Abt in the year 1987. In his book "Serious Games" [1] he introduced:

"We are concerned with serious games in the sense that these games have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement."

In those days computer games were not commonplace, so he established this definition for traditional games.

3.2.1 Serious Games

Nowadays serious games are often used for training, education, advertising or simulation. The virtual reality allows testing situations that are too dangerous, expensive or impossible to train in reality [19]. For this "genre" the term "serious games" is compulsory. First mentioned by Abt [1], it became popular for computer games in 2002 with the appearance of the "Serious Games Initiative" [20]. On their homepage they provide the following definition on their work and serious games:

"The Serious Games Initiative is focused on uses for games in exploring management and leadership challenges facing the public sector. Part of its overall charter is to help forge productive links between the electronic game industry and projects involving the use of games in education, training, health, and public policy."

More general and nearer on Abt's definition serious games are nowadays often also defined as a concept that does not only want to entertain people but also provide additional benefit. Anne Derryberry [4] for example provides the following definition:

"Serious games are designed with the intention of improving some specific aspect of learning, and players come to serious games with that expectation. Serious games are used in emergency services training, in military training, in corporate education, in health care, and in many other sectors of society"

According to Susi et al. [19] and Breuer & Bente [3] there are some concepts related and sometimes overlapping with serious games:

- **E-learning:** Does not have gaming character. Learning is supported by computer technology. Often e-learning is associated with distance learning or the allocation of additional (digital) content.
- **Edutainment:** Was a widespread concept in the 1990's. This generic term merges *"any kind of education that also entertains [...]"*. This concept can be seen as the forerunner of today's serious games with the limitation that those games primarily aimed to preschool- and young children. The topics are mostly mathematics, reading and science.
- **Game-based learning:** Defines a learning outcome and improves the training performance by the effectivity of *"its engagement, motivation, role playing and repeatability [...]"*.
- **Digital game-based learning:** Is a derivative of game-based learning with the characteristic that it deals with digital games.

According to Ritterfeld & Weber [17] there are three different integration possibilities of learning and entertainment in digital games [3]:

- **Blending paradigm:** Educational content is designed as the entertaining part. The completion of gaming tasks is equivalent to the acquisition of knowledge.
- **Reinforcement paradigm:** Follows the saying "Business before pleasure". Entertaining game content must be earned by completion of educational gaming parts.
- **Motivation paradigm:** Entertaining content is used to arouse the players curiosity and put the focus on the educational content.

Durkin et al. [6] researched the impact of serious games on children and adolescents with special educational needs (SENs). Young people with SENs face problems with friendship and acceptance among peers much more

often than children and adolescents with typical development (TD). The formerly widespread adoption that playing computer games isolates people could be disproved. Often actual games are subject of discussion in the circle of friends. This fact involves young people with SENs in the social lives of their peers. Even if they are less successful, they can join conversations about the games. Gutstein [6] [12] observed the positive impact of common interests. He observed a 14-year-old boy named Jack who suffers from Asperger's. Jack never left home when not forced to. His only impulse to leave the house were his *"frequent trips to the store to purchase a new video game"*. Due to his handicap he had poor social skills and rarely peer relationship. In spite of everything he found a friend in his class with the same exaltation for video games. Jack's mother reported that *"they frequently sat together at lunch deep in discussion of game characters and scenes"*.

Durkin et al. [6] concluded that research on social games for young people with SENs are stuck in infancy but there is – at least for some individuals – potential to get involved in social life. The question which games can provide challenging content and lead to benefits has to be answered by further research. Also it must be determined which players can benefit under which circumstances.

3.2.2 Social Serious Games

The great popularity the games on Facebook enjoy and the fact that serious games have become more and more popular leads to the idea to combine these application areas.

Nowadays most of the serious games are designed as single player games. Learning content is packaged into a story the user has to play through and learning outcomes are controlled by tasks a player has to solve. Further

Konert et al. [13] criticize that users could get stuck in the game when the learning curve of the game and the player's abilities are not perfectly in balance. Searching for the right solution can be very time consuming and frustrating.

Therefore the advantages of social networks can be used to succeed in the game. Konert et al. [13] propose to apply the concepts of *Peer Tutoring* [26] and *Peer Assessment* [18] on serious games in conjunction with social networks. Konert and his colleagues developed a framework which offers two main functionalities. The first supports the *exchange of user-generated content*. This enables users to store content related to the game in a database and other users can access this information if they need hints to proceed. On the one hand this meets the concept of *Peer Tutoring* because information can be shared and accessed by every player and in addition the concept of *Peer Assessment* is met because shared solutions can be rated by the community. The second functionality concerns *influencing the game*. This means that the players include their social networks into their gaming experience, what can increase the players awareness for the game and also invite other people from the social network to participate in the game. The second point provides more incentive, additionally to posted text, posts also invite to take part of the game.

3.3 Psychological background

The idea of MindBook is based upon a tested and established psychological protocol called *Modular Approach to Therapy for Children with Anxiety, Depression, Trauma or Conduct Problems*, short *MATCH-ADTC*. This protocol is a collection of different procedures on individual problem patterns.

The single modules of the MATCH-protocol all follow a uniform template to shorten the period of vocational adjustment and offer a homogeneous "look and feel" for the therapists [25].

The approach of MindBook is now to transfer (some of) the modules for the depression-therapy into a "Therapeutical Social Network". Table 3.1 is taken from [25] and first shows the core modules and following the modules that can be used to manage obstacles for depression.

Module name	Purpose
<i>Core modules</i>	
Activity Selection	Teaching the child to identify and select pleasant events to improve mood
Cognitive Coping - BLUE	Correcting cognitive errors related to depression
Cognitive Coping - TLC	Additional cognitive strategies for depression
Getting Acquainted - Depression	Engaging and getting to know the child
Learning About Depression - Child	Psychoeducation for depression
Learning About Depression - Parent	Caregiver psychoeducation for depression
Learning to Relax	Progressive muscle relaxation, guided imagery, breathing
Plans for Coping	Review of treatment and termination planning for depression
Presenting a Positive Self	Training in social skills related to self-presentation

Problem Solving	Training in structured problem solving skills
Quick Calming	Covert relaxation procedures
Wrap-Up	Termination with child
<i>Managing obstacles</i>	
Rewards	Training in implementing a reward program
Safety Planning	Training in managing personal safety
Time Out	Training in time out from reinforcement
Trauma Narrative	Review of written narrative of traumatic events
Active Ignoring	Teaching caregiver to ignore unwanted behaviors and attend to positive behaviors
Cognitive - STOP	Correcting cognitive errors related to anxiety
Giving Effective Instructions	To cover how to give instructions so as to maximize compliance
Making a Plan	Management of antecedents or triggers to reduce conduct problems
Practicing	Exposure to feared stimuli

Table 3.1: Content Modules for Depression in the MATCH-ADTC protocol [25]

Most of the core modules are implemented in MindBook. Loosely speaking there are two major types of implementation of the modules. One is representing the content in form of video clips, images or audio files the child consumes. The second type are games the user has to play through. In Table 3.2 the core modules implemented in MindBook are listed in alphabetic order and in what MindBook module(s) they are realized.

Module name	MindBook module(s)
Activity selection	Hobby selection: Choose hobbies from a pre-defined list (e.g., singing, etc.) Weekplanner: Plan one activity per day they like to do in the following week
Cognitive Coping – BLUE	Game – Memory: Replace negative thoughts by positive ones.
Cognitive Coping – TLC	Image – Change the channel: Try to not to think about negative things Image – Talk to a friend: Talking to friends can distract from bad vibes. Image – Search for the rainbow: Every cloud has a silver lining. Game – Video decision: Figure out the positive solutions for a problem.
Getting Acquainted	Userprofile: Presenting basic information like name, age and hobbies. Feelingsweather: Show how you feel via a weather scale.
Learning About Depression – Child	Various psychoeducational videos: Helpful tools for depression.

Learning to Relax	Audio – Muscle relaxation: 3 different audio clips that help to relax. Video – Slow your breathing: Conscious breathing helps to relax. Video – Chilloutzone: "Flee" to your personal chilloutzone.
Presenting a Positive Self	Feelingsweather: Show how you feel via a weather scale. Posting to friends: Positive presentation leads to positive feedback. Profileheaderimage: Shades of gray depending on the feelingsweather.
Problem solving	STEPS: Five steps to solve problems.

Table 3.2: MindBook modules

For all the modules in MindBook introductive videos are available in order to guide the child with respect to what it needs to do. Furthermore at the end of each session a task sheet for homework can be downloaded. These worksheets deal with the modules the user learned about in the session.

The module "Getting Acquainted" implementation was difficult. The therapist asks for the basic information like name, gender and age of the child in the course of registration. However, to give feedback to the child how his actual mood acts on other people, it is necessary to request this mood. We discussed different methods to fulfill this task:

- Scale from negative to positive
- Feelingsthermometer
- Feelingsweather



Fig. 3.1: Feelingsweather at the login

In order to give the children a positive feeling while selecting their mood, we discarded the idea about the negative/positive scale, because rating the own mood as obviously negative does not leave a positive feeling anyway. Hence the feelingsthermometer and the feelingsweather were the only options. We discussed the pros and cons of both approaches and came to the conclusion that both ideas are very similar and differ mainly in the optical appearance. Due to the fact that a thermometer normally is depicted vertically and the integration into the application was easier horizontal the decision was made to the feelingsweather.

The feelingsweather is shown in Fig. 3.1 and is chosen at the beginning of each session for all days since the last session. This gives the application a clue about the user's mood and depending on this data friends and their postings are selected, the feeling baseline is calculated and the gray-ing of the profileheaderimage is set. From this it can be concluded that the feelingsweather is an important basis of the application.

The modules for managing obstacles are implemented less distinctive. There is only the module "Rewards" implemented with the medals that can be earned for filling in the task sheets and achieving the planned activities.

Chapter 4

Implementation

In this chapter I describe the implementation of MindBook beginning with the used programming languages, libraries and tools. Afterwards I describe the single elements of the application, their implementation and functionality.

In the future the therapy concept of "MindBook" is intended to help children and adolescents in their daily lifes. Therefore and to satisfy the claim to be similar to a social network the project was realized as a web page. This is advantageous in multiple ways.

- **Access:** The therapy can be accessed from everywhere, where Internet connection is established. On the one hand this is useful for therapists who are not limited to the use of a specific device with the software installed on and on the other hand it opens up the possibility for the children to train out of therapy sessions.
- **Cross-platform and device independent:** Since only standard-compliant mark-up was used, every modern web-browser (except of Google Chrome) is able to render "MindBook" in a correct way. Of course there are some minor differences in presentation due to browser

implementation-dependent discrepancies, but all in all, the functionality is guaranteed.

- **Data integrity:** The data is stored remotely from the used device(s). If a device fails, the stored data and thus the progress of therapy is not lost. Furthermore the therapist is able to control the progress of his patient remotely.

4.1 Programming Languages and Database

Nowadays web-applications are dynamic and based on the users' decisions. Therefore it is not enough to program a static web page using HTML and CSS, and "MindBook" is a mixture of HTML, CSS, PHP and JavaScript which allows the generation of dynamic content. The data is stored in a MySQL database.

4.1.1 HTML

HTML stands for ***H**ypertext **M**arkup **L**anguage* and is used to give web documents a clear structure. HTML is, as the name suggests, a markup language that uses a set of predefined tags to markup different areas and elements in a web document. It is derived from the Standard Generalized Markup Language (SGML) and the last W3C [24] recommendation state was reached by HTML 4.01 in December 1999 [21].

The version used in this work is HTML 5. This version is in the status of a Candidate Recommendation of the W3C. The latest published status can be found in [22]. Up to date information can be found in the Editor's Draft [23]. The decision to use this version was made due to the extended possibilities to layout a page and the native support of audio and video files.

HTML was used to structure the application and to allow the creation of specification compliant and valid code. To be valid at least the following code has to exist.

```
1 <!DOCTYPE html>
2 <html>
3     <head>
4         <!-- Here goes information the browser needs -->
5     </head>
6     <body>
7         <!-- Here goes the expected output of the website -->
8         <header>
9             <!-- Here goes the information shown in the header
10         -->
11         </header>
12         <aside>
13             <nav>
14                 <!-- Here goes the navigation -->
15             </nav>
16         </aside>
17         <article>
18             <!-- Here goes the main content -->
19         </article>
20         <footer>
21             <!-- Here goes the information shown in the footer
22         -->
23         </footer>
24     </body>
25 </html>
```

Listing 4.1: HTML 5 backbone with simple page reproduction

The first line in listing 4.1 is the document type definition (DTD). Compared to previous HTML versions the DTD has significantly simplified to **<!DOCTYPE html>** in HTML 5.

The root element of every HTML document is the **<html>** tag. This root element is closed at the end of the document with **</html>**. Every element in between also has to be closed, when opened. There are some



Fig. 4.1: Main structure of MindBook. The colored frames indicate the different areas: red=header, orange=aside, green=nav, blue=article and yellow=footer

exceptions like the tag for images that are standalone. These tags are closed before the closing `>`.

Information given in the `<head>` section is not shown in the output of the website. This information is important for the browser, crawlers and so on. For example CSS stylesheets and JavaScript documents are linked in this section. Further information about the author, keywords for search engine crawlers or the expire date of the document are given.

The `<body>` is the area where the webpage-content is written. The `<body>` can be separated in different areas. In Listing 4.1 the page is separated in a `<header>`, an `<article>` and a `<footer>`. As the names suggest, the `<header>` is intended to be the websites top, as the `<footer>` is bound for the pages bottom. The `<article>` holds content of the web page. The `<aside>` element holds information relating to the whole website, if it is not written inside an `<article>` element. In the listing above it wraps the navigation written in the `<nav>` element.

The MindBook page also follows this structure (see Fig. 4.1).

4.1.2 PHP

The forerunner of PHP named PHP/FI (Personal Home Page / Forms Interpreter) was founded in 1995 by Rasmus Lerdorf. PHP/FI was a collection of Perl scripts for the analysis of website visits. However these possibilities were not enough, so Lerdorf broadened the scripts for database communication and wrote the whole project in C.

In 1997 Andi Gutmans and Zeev Suraski worked on an application for their university and found that the possibilities of PHP/FI were not enough. So they affiliated with Lerdorf and announced PHP 3.0 as follower of PHP/FI. PHP is extremely expandable and offers a broad assistance for databases and well documented API's. Furthermore it supports object oriented programming (OOP). This led to a high acceptance and use among webdevelopers. With the new version also the name was changed from PHP/FI to PHP. This stands for PHP: Hypertext Preprocessor. The actual version is PHP 5, released in July 2004. [16]

PHP is, as the name suggests, a preprocessor. Therefore it is necessary, that PHP is installed on the web server, because the client request is handled on the server and just the resulting page or document is delivered to the client. In detail, when receiving the request the server loads the file and passes it to the PHP interpreter. The interpreter generates the desired code and returns it. This result is delivered to the client (see Fig. 4.2).

For example the simple PHP script in Listing 4.2 will generate and deliver the HTML page in Listing 4.3.

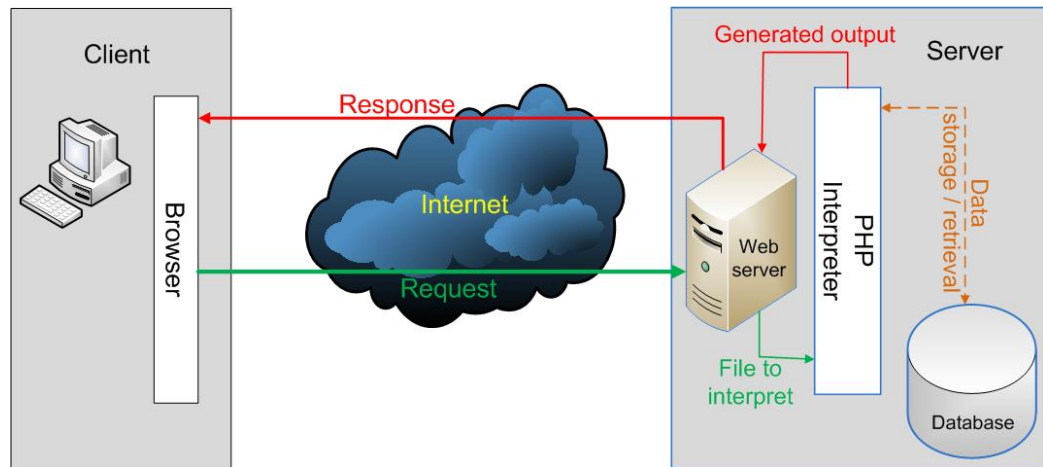


Fig. 4.2: Generation of a PHP file from request to response

```

1 <!DOCTYPE html>
2 <html>
3     <head>
4         <!-- Here goes information the browser needs -->
5     </head>
6     <body>
7         <div><?php echo 'Actual date: '.date('Y-m-d'); ?></div>
8     </body>
9 </html>

```

Listing 4.2: Simple date example in PHP

```

1 <!DOCTYPE html>
2 <html>
3     <head>
4         <!-- Here goes information the browser needs -->
5     </head>
6     <body>
7         <div>Actual date: 2013-09-07</div>
8     </body>
9 </html>

```

Listing 4.3: Generated HTML response on September 7, 2013

This functionality enables to generate dynamic content based on user input or database content. MindBook makes good use of database commu-

nication and the evaluation and storage of form data.

4.1.3 JavaScript and jQuery

JavaScript and jQuery are subsumed in one section because they are closely related.

JavaScript

JavaScript (JS) was developed in 1995 by Netscape. In 1996 it became widespread and 1997 it was standardized under the name ECMA-Script. JS has played a subordinate role for a long time but in 2005 with the boost of AJAX (formerly known as XMLHttpRequest) it became very popular again.

JavaScript is a language interpreted on the client. It is used to validate form data, change images or load data. AJAX is used to load or save data in an asynchronous manner.

In MindBook most of the JavaScript functionality is wrapped in jQuery. Pure JS is used for timing-related elements and functions that are not wrapped in the jQuery framework.

jQuery

jQuery is a JavaScript framework which wraps the browser specific differences of the language. Developed was jQuery in 2006 by John Resig and is the most used JS framework.

jQuery accesses the element to modify over CSS selectors. In this project the framework is used for loading subsites, show and hide elements, save data in the background and so on.

4.1.4 CSS

CSS stands for *Cascading Stylesheets*. The idea was born in 1994 by Håkon Wium Lie, who together with Bert Bros developed a language to define style definitions. The advantage over other styling languages was the fact that definitions can be inherited from other rules. In 1996 CSS was standardized by the W3C as CSS Level 1 Recommendation [27]. The actual version is CSS 3 and supports many things that previously were implemented with images or JavaScript (e.g. round corners or transformations).

Cascading Stylesheets are used to define page layouts, set the position of elements, define their color, and make them visible or invisible. These are the main functions CSS is used for in MindBook.

In the following example the basics are shown.

```
1 body {
2     background:#000000;
3     color:#FFFFFF
4 }
5
6 h1 {
7     background:#FFFFFF;
8     color:#000000;
9
10    width:100%;
11    height:40px;
12
13    padding:5px;
14 }
15
16 #logo {
17     position:absolute;
18     margin-left:10px;
19     margin-top:5px;
20 }
21
22 .nav-element {
23     background:#FF0000;
```

```
24     color:#FFFF00;  
25 }  
26  
27 .nav-element:hover {  
28     font-weight:bold;  
29     text-decoration:underline;  
30 }
```

Listing 4.4: Basic CSS example

As shown in the basic example in listing 4.4 every CSS definition needs a selector that defines the tag to be influenced by the following rule. Selectors can be:

- **HTML-Tags:** The representation of every occurrence of this element is influenced. In this example the whole page is black with white text (influenced with the definition of the body element). All headings of level 1 (h1) have black text on white ground with a width over the whole page-width and 40 pixel of height. The gap to the elements border is 5 pixel.
- **ID's:** ID's are accessed in CSS with a hash-tag (#) before the selector and are only allowed once in a document. ID's are attached to standard HTML tags (e.g. <div id="logo">...</div>). In this example the field for the website's logo is defined with an absolute position at 10 pixel from the left and 5 pixel from above.
- **Classes:** Classes are similar to ID's, with the difference, that they are allowed to occur multiple times. They are also attached to HTML tags (e.g. <div class="nav-element">...</div>) and are accessed in CSS with a dot. In the listing above elements with the class *nav-element* have red background color and yellow font.

- **Pseudo classes:** The last block in the listing is a so-called pseudo class attached to the selector `nav-element`. Pseudo classes influence the appearance of an element only under specific circumstances. The above shown example fires when the mouse hovers over an element with the class `nav-element`. In this case the text of this specific `nav-element` will become bold and underlined.

Pseudo classes can not be used as standalone selectors. They always must be attached to an element. It is possible, but not necessarily useful, to attach pseudo classes to all of the above mentioned selectors.

4.1.5 Database

In the past, websites were static and the content was saved in HTML files. Nowadays information is fast changing, and editing HTML pages would be too time consuming. Therefore in modern webdesign information and representation are separated. The HTML document is generated for example by parsing a PHP file. However, the information has to be stored somewhere. At this point databases come into play. There are many different database systems, most of them based on SQL (Structured Query Language). The database of choice in this project is the MySQL database.

MySQL

The MySQL database was initially released in 1995 by the Swedish MySQL AB company. It is a SQL interface with a similar API as that of `mSQL` which had not good enough performance. Nowadays MySQL is one of the most used relational database management system in the world [7] and since 2010 owned by Oracle. The name of MySQL is derived from the name of the co-founder's daughter My [14] [30].

MySQL stores the data in different tables inside a database. Tables consist of columns and rows with the stored data. To handle the information SQL statements are used for insertion, selection, update or deletion of data.

```
1 INSERT INTO table(column1, column2, ..., columnN) VALUES ("value1", 1, ...,
   "valueN");
2
3 SELECT * FROM table;
4 SELECT column2 FROM table WHERE column1="condition";
5
6 UPDATE table SET column2="newContent" WHERE column1="condition";
7
8 DELETE FROM table WHERE column1="condition";
```

Listing 4.5: Basic SQL example

Listing 4.5 shows the four basic database operations: insertion, selection, update and deletion of data.

- First of all we have to create data. This is handled in the first example where the columns 1 to N are filled with different values. MySQL supports different data types. In this example character strings and an integer are inserted. This statement creates a new row, a so-called "tupel".
- The third line selects all data stored in the table *table*, whereas the second SELECT-statement fetches only the data stored in *column2* if the condition meets the content of *column1*.
- The example on line 6 updates the content of *column2* to "newContent" in the table *table* if *column1* achieves the condition.
- The last sample deletes every dataset from table where the condition is fulfilled in *column1*.

In MindBook all data is stored in a MySQL database. This data is on the one hand created from the therapists and on the other hand from the user respectively the application.

4.2 Tools

Of course it is possible to code whole web pages in a simple text editor and set up a database on the command line. However there are many helpful tools and due to good assistance I have also used some of those tools I would like to introduce in this section.

4.2.1 Aptana Studio

Aptana Studio [2] is an open source IDE (integrated development environment) for web development. It is based on Eclipse and available as stand-alone version or as plug-in for Eclipse for Windows, Mac OS X and Linux. For the development of MindBook I used the stand-alone version Aptana Studio 3 for Windows.

The advantages of this IDE are syntax highlighting and auto complete for HTML, CSS, PHP (see Fig. 4.3) and the integration of jQuery. Furthermore it is possible to directly upload the project and files to the server on change.

4.2.2 phpMyAdmin

The tool phpMyAdmin [15] is a web based tool for the creation and administration of MySQL-databases. The version used for MindBook is version 3.5.2. It is written in PHP and allows the creation, modification, deletion and many other operations MySQL offers (e.g. views) on databases, tables and content. For backup purposes the whole database or parts of it can be

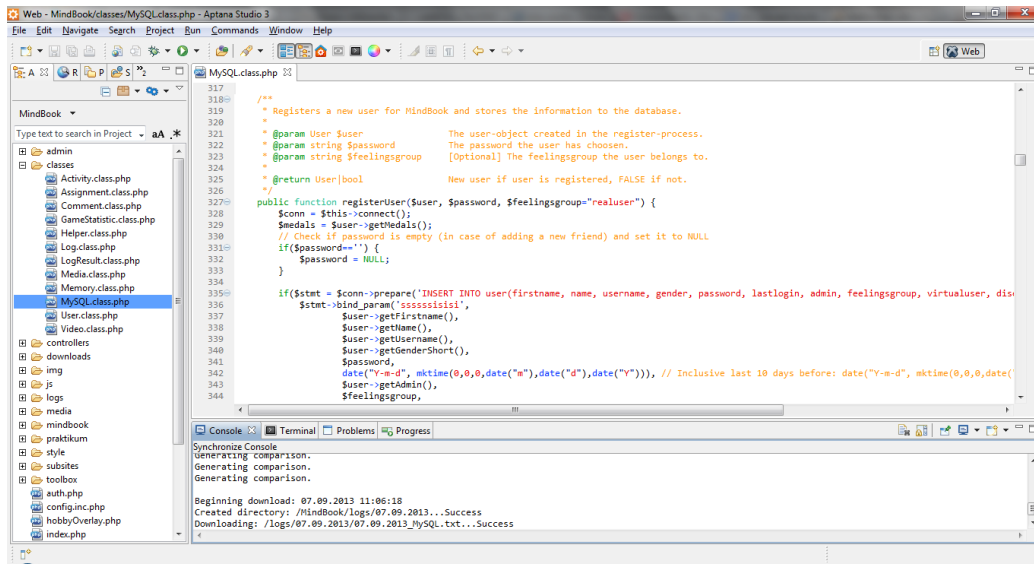


Fig. 4.3: Aptana Studio showing a PHP file

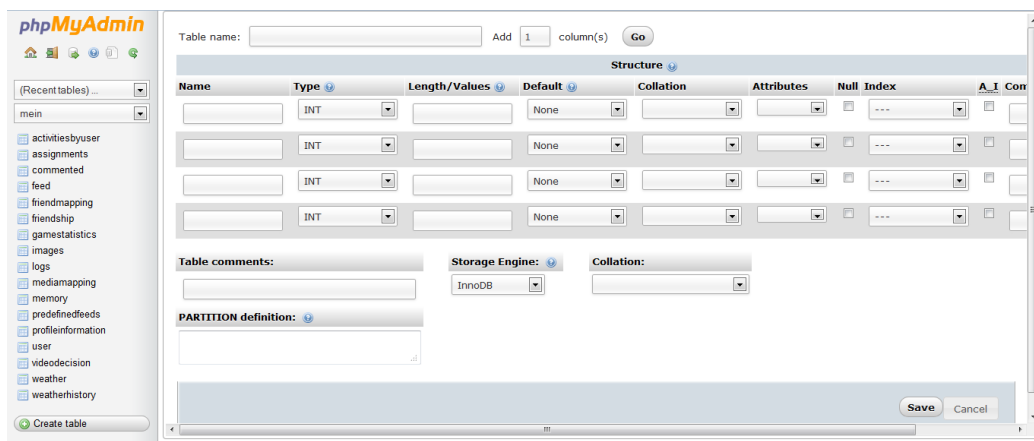


Fig. 4.4: The dialogue for the creation of a new table in phpMyAdmin

Table	Action	Rows	Type	Collation	Size	Overhead
activitiesbyuser	Browse Structure Search Insert Empty Drop	257	InnoDB	latin1_swedish_ci	48 KiB	-
assignments	Browse Structure Search Insert Empty Drop	6	InnoDB	latin1_swedish_ci	16 KiB	-
commented	Browse Structure Search Insert Empty Drop	2,072	InnoDB	latin1_swedish_ci	240 KiB	-
feed	Browse Structure Search Insert Empty Drop	0	InnoDB	latin1_swedish_ci	32 KiB	-
friendmapping	Browse Structure Search Insert Empty Drop	7	InnoDB	latin1_swedish_ci	16 KiB	-
friendship	Browse Structure Search Insert Empty Drop	2,028	InnoDB	latin1_swedish_ci	144 KiB	-
gamestatistics	Browse Structure Search Insert Empty Drop	390	InnoDB	latin1_swedish_ci	48 KiB	-
images	Browse Structure Search Insert Empty Drop	232	InnoDB	latin1_swedish_ci	48 KiB	-
logs	Browse Structure Search Insert Empty Drop	6,974	InnoDB	latin1_swedish_ci	1.5 MiB	-
mediamapping	Browse Structure Search Insert Empty Drop	22	InnoDB	latin1_swedish_ci	16 KiB	-
memory	Browse Structure Search Insert Empty Drop	12	InnoDB	latin1_swedish_ci	16 KiB	-
predefinedfeeds	Browse Structure Search Insert Empty Drop	32	InnoDB	latin1_swedish_ci	16 KiB	-
profileinformation	Browse Structure Search Insert Empty Drop	199	InnoDB	latin1_swedish_ci	96 KiB	-
user	Browse Structure Search Insert Empty Drop	197	InnoDB	latin1_swedish_ci	16 KiB	-
videodecision	Browse Structure Search Insert Empty Drop	16	InnoDB	latin1_swedish_ci	16 KiB	-
weather	Browse Structure Search Insert Empty Drop	7	InnoDB	latin1_swedish_ci	32 KiB	-
weatherhistory	Browse Structure Search Insert Empty Drop	1,654	InnoDB	latin1_swedish_ci	192 KiB	-
Sum		14,102	MyISAM	latin1_swedish_ci	2.5 MiB	0 B

Fig. 4.5: Overview of the tables used in MindBook

exported (structure and content, only structure or only content) to different formats (e.g. SQL, CSV, JSON, ...). phpMyAdmin takes over a lot of work for the developer. It is not necessary to write SQL code by hand. Figure 4.4 shows the dialogue for the creation of a new table. The developer just has to enter a table name and the specifications for the fields. The overview of the tables used in the MindBook database is shown in phpMyAdmin as pictured in Figure 4.5.

The column on the left side of the window allows quick access to the various tables in the selected database. By selecting a table the contained data is shown and the possibilities for editing, copying and deletion are given.

4.3 Layout

The layout of the MindBook website is very similar to Facebook. This is due to the popularity of Facebook and the requirement to design a social network-similar platform.

The basic structure are three columns between a single-colored header and footer. The structure of three columns remains the same across all pages of the application. The content of the left column is always the navigation, the content of the center and right column are dependent on the visited subsite. The therapeutic parts are implemented in overlays.

4.3.1 Overlays

To fulfill the requirement as a "Therapeutical Social Network" the therapeutically significant parts have to be highlighted. We discussed how it can be guaranteed that children follow the therapeutic contents without distraction by the rest of MindBook. Due to the fact that overlays are a very common tool in modern web applications, we have decided to use this technique for the relevant parts inside the application.

Overlays are areas that conceal parts of the application. The overlays in MindBook cannot be closed by the user, which helps to attract the attention and focus on the therapeutic content. To increase this effect the rest of the page in the background is grayed out and inactive. To close the overlay the expected action has to be fulfilled. This actions can be saving the inserted data or changes or the end of a game or video. The parts realized in overlays are:

- Login checkup
- Videos
- Games
- Hobby selection
- Logout

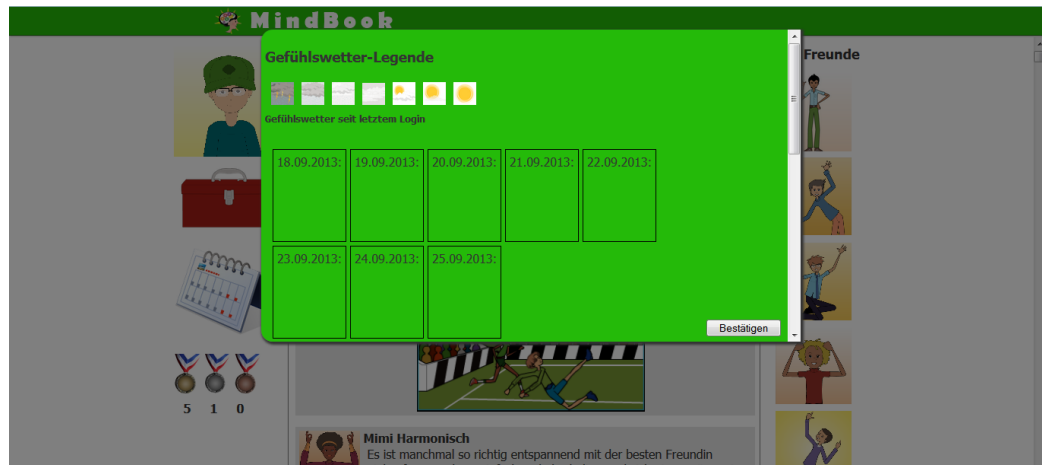


Fig. 4.6: Login overlay

Further parts implemented in overlays are the tools from the toolbox and the developer information, but those (except of the games) can be closed by the user by clicking the overlay.

Login overlay

The login checkup (shown in Fig. 4.6) requests the feelingsweather from the last session until the actual day, asks if the practice sheet is filled in and how many of the activities planned in the last session are realized. Further the user has the possibility to change the emotional expression of the profile image.

Videos



Fig. 4.7: Video overlay

Videos are split into educational videos and introductory videos. On computers videos start automatically and cannot be fast-forwarded or rewinded. This forces the user to watch the whole video and follow the con-

tent of it. Unfortunately autostart is not available on mobile devices to protect the user of exceeding data usage. Furthermore the progress bar and controls can not be hidden whereby on tablets or mobile phones fast-forwarding or rewinding is possible.

Hobbies

Hobbies can be changed in the user profile and are designed as an overlay to avoid children from leaving the hobby selection without saving the hobbies. The maximum number of hobbies the children can select are 10 and this limitation is guaranteed by setting the checkboxes to inactive.

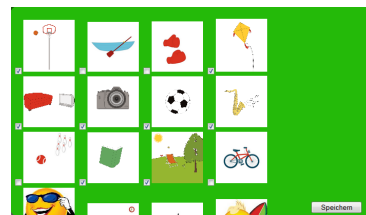


Fig. 4.8: Hobby overlay

Games

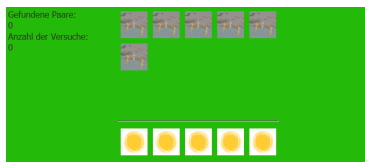


Fig. 4.9: Game overlay

The games are designed in a way they must be played until they are finished. When the aim of the game is achieved, the overlay closes automatically and the statistic is saved (see Fig. 4.9). This prevents that the

user interrupts the game and the statistic is not saved.

Logout

When the user leaves MindBook there is an overlay before finally logging out the application. This overlay (see Fig. 4.10) shows the number of earned medals and - in the first five sessions - the link to the consulta-



Fig. 4.10: Logout overlay after the first five sessions

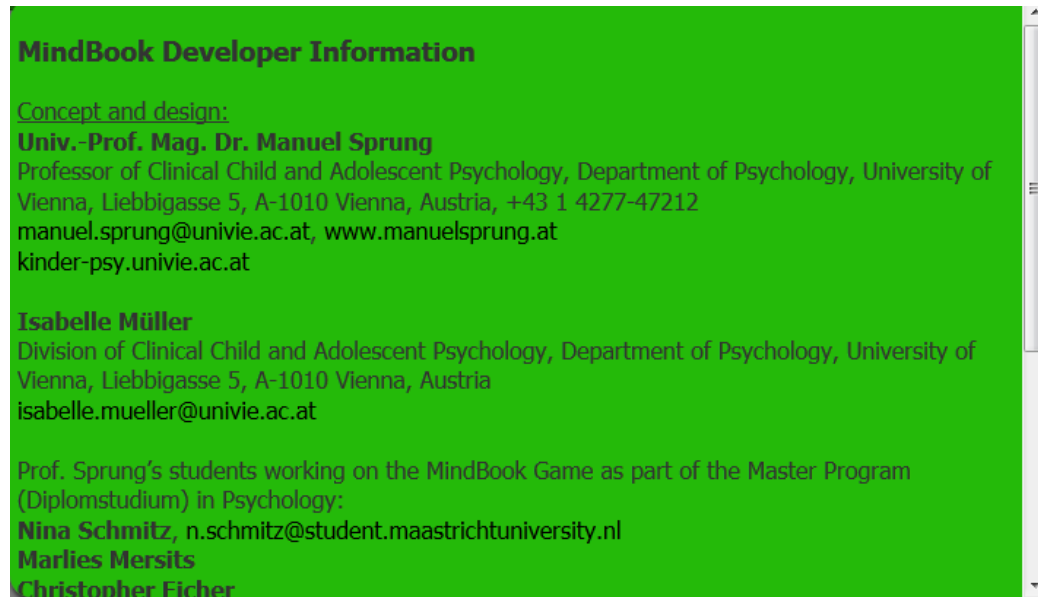


Fig. 4.11: Developer information



Fig. 4.12: MindBook header with emblem, logout and feelingsweather

tive documents for this session. After all a click on the "Logout" button completes the logout and thus the session and redirects the user to the login page. A renewed login starts the next session.

Developer information

The developer information (see Fig. 4.11) is not a therapeutic part, however it is realized as an overlay due to an uniform appearance. The overlay contains a list of the team involved in the development of "MindBook" with contact data.

4.3.2 Header

The header (see Fig. 4.12) contains the MindBook emblem as link to the main page, the logout-button and the actual feelingsweather as symbol and its textual description. The color green was chosen for the header because it has a calming effect to the children. First, it was considered to accommodate the medals in the header, but for reasons of space and due to the visibility those were housed in the navigation column.

4.3.3 Navigation column

The navigation column (see Fig. 4.13a) consists of the profile image as link to the profile page, the toolbox-image as link to the toolbox and the calendar as link to the week planner. The toolbox-image changes when clicked from a closed to an open toolbox. The last point is the information about the earned medals. Though the medals are not part of the navigation I proposed to show it in this column due to the fact that it is always visible to the children at this position. The proposal was approved because the medals are a motivational tool for the children and this position is more in focus than the header.

4.3.4 Center column

The column in the center is the main area of the application. The content of this area depends on the selected subsite. The possibilities are

- Friendfeed
- Userprofile
- Weekplanner
- Toolbox

Friendfeed

The friendfeed (see Fig. 4.13d) is loaded after the acknowledgment of the login overlay or after a click on the MindBook emblem in the header. The feed is filled with textual posts and pictures from friends. The generation of the feed content is dependent from the feelingsweather baseline and will be clarified later.

Userprofile

The userprofile (see Fig. 4.13e) shows the user's profile image, a header image and the basic information about a user. This is the name, the age and the gender of the user. Further the hobbies are pictured and can be increased by hover the image with the mouse.

The header image can take different shades of gray, depending on the feelingsweather baseline. The userprofile can be loaded by a click on the profile image in the navigation column or by clicking a friend in the friendlist. If a user opens his own profile, he can access the hobby overlay to edit his preferred hobbies. After saving the changes the overlay closes automatically. I give more information on the hobby overlay in the section about overlays.

Weekplanner

The weekplanner can be accessed via the calendar link in the navigation column. This area shows a list of activities the user can drag to different days of the week (see Fig. 4.13f). This should help children to structure their daily lives. After dropping the wanted actions to the single days the weekplanner can be saved, accessed and changed until the already planned week is over. To change a planned day the user only has to drag a new activity over the old one and it will be replaced. At the beginning of a new

week, the planner appears blank and can be filled from the scratch again. The number of the completed actions of these planned activities are requested in the loginoverlay.

The toolbox is accessed via the toolbox link in the navigation column. This area shows all tools available in MindBook (see Fig. 4.13g). In the beginning not all tools are available, due to the missing explanation. These tools are explained in the sessions they belong to and are available after the introductory videos. When opening the toolbox, the link image in the navigation column changes from a closed to an open toolbox. Accessing a tool in the box opens an overlay with the specific tool.

4.3.5 Right column

Like in the center column the data content of the right column is dependent from the loaded subsite. In contrast to the center column the choice is smaller. Most subsites cause the right column to show the friendlist (see Fig. 4.13b). Only the profile page changes the appearance. If the user accesses his own userprofile an overview over the feelingsweather of the last nine days is shown (see Fig. 4.13c). If the userprofile of a friend is visited the right column appears blank.

4.3.6 Footer

The footer is in the same color like the header and contains the copyright notice and a link to the developer information. By clicking this link the information about the development team is shown in an overlay.



(a) Navigation

(b) Part of the friendlist

(c) Weather overview



(d) Friendfeed

(e) Userprofile of "Ali Unparteiisch"

Fig. 4.13: The different MindBook areas



(g) Toolbox with all tools enabled

Fig. 4.13: The different MindBook areas (continued)

4.4 Data storage

Of course the layout alone is not an application. To fill MindBook with life, data to fill the layout is needed. As mentioned above the data of MindBook is stored in a MySQL database consisting of 16 tables. The design tries to avoid data redundancy and connects data from different tables on given dependencies. Figure 4.14 shows an overview of the tables and the dependencies. A detailed diagram can be found in the Appendix. Following I describe the single tables and their content.

Table user

The "user" table contains the main information about users. This is primarily information the application needs for user authentication and correct content output.

The informations stored in this table are a unique **id** to identify the user in other tables, the user's name (splitted into **first name** and **last name**), the **username**, the **gender** of the user, the **password** as hash-value, the **date of the last login**, the **feelingsgroup** of the user (defines if a virtual

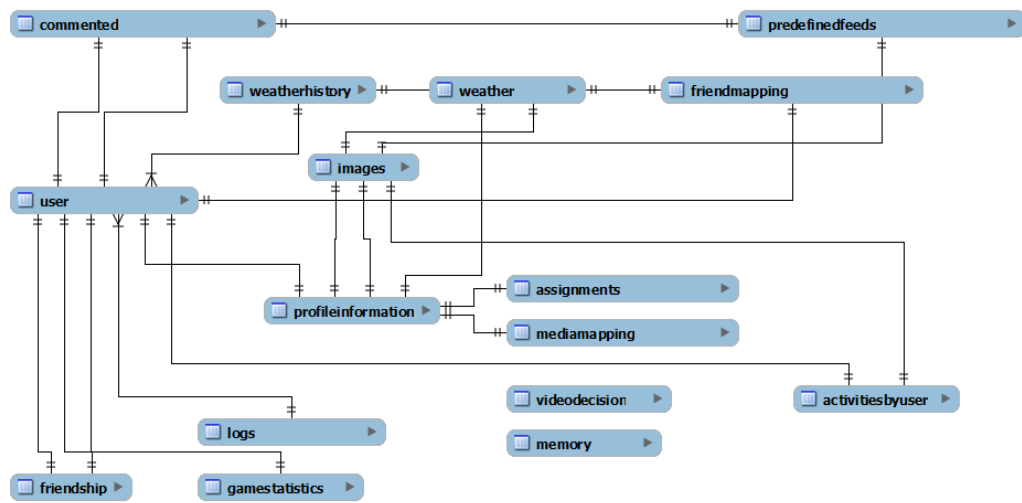


Fig. 4.14: Layout overview of the MindBook database structure

friend is "positive", "neutral" or "negative"), the **disease** the user suffers from ("depression" or "eatingdisorder"), the information if the user is an **administrator** or not and the **state** if the user is **activated** or not

This table is linked to the following tables:

- profileinformation
- weatherhistory
- activitiesbyuser
- commented
- friendship
- gamestatistics
- logs

Table profileinformation

The "profileinformation" table contains information about the user's profile. This information is shown to the user in different parts of the application, and is stored separately from the user information to ensure the anonymous eval-

uation of the data by the psychologist. The only link to the user information is given by the user id.

The information stored in this table is the unique **userid**, the **registration date**, the **logincount** (to determine the current session of the user), the **profileimage** (stores the id of the image in the image table), the id of the **profileheader image** in the image table, the id of the **actual feelingsweather** in the weather table, the **hobbies** as a comma separated list of image ids in the image table and the number of **gold**, **silver** and **bronze medals**.

This table is linked to the following tables:

- user
- weather
- images
- assignments
- mediamapping

Table friendship

The "friendship" table is responsible for the links between different users. The information stored in this table is a unique **friendshipid** and two userids as **userid** and **friendid**. These two users are recognized as friends by the application.

This table is linked to the following table:

- user

Table commented

The "commented" table stores information about the posts the friends have posted to a users' pin board.

The information stored in this table is a unique comment **id**, the **userid** of the user the comment is written to, an **authorid** (the userid of the comment's author), an **entrydate** and a **feedid** (the id of the post in the "predefined-feeds" table).

This table is linked to the following tables:

- user
- predefinedfeeds

Table predefinedfeeds

The "predefinedfeeds" table stores a list of different feeds the virtual friends can post to a user's pin board. Which feeds are chosen depends on different factors. To select an appropriate entry, following information is stored to each feed.

The information stored in this table is a unique **id**, the **text** of the comment, an optional **image** id (if there is an image for this feed in the "images" table), the **feelinggroup** the comment is appropriate for, information if the feed is **genderspecific** or not and the **disease** the feed is suitable for.

This table is linked to the following tables:

- commented
- images

Table images

The "images" table is the location where the information about all images is stored. The table is meant to store information about the memory location of the images and the category they belong to.

The information stored in this table is a unique **id** (this is used to link to the images in other tables), an **imagename**, the **filepath** (relative to the root directory of the application), a **category** and the **profileimagegroup**. The last entry is used to link the four different images to the different feelings expressions of the profile image (happy, neutral, sad and angry) together.

This table is linked to the following tables:

- profileinformation
- predefinedfeeds
- weather
- activitiesbyuser

Table weather

The "weather" table stores essential information about the feelingsweather. In this table it is defined which ranking results in which feelingsweather.

The information stored in this table is a unique **id**, the feelingsweather **value** (from integers -3 to 3), the **minimum ranking** for this feelingsweather value, the **maximum ranking** for this feelingsweather and the **id** of the weather image in the images table.

This table is linked to the following tables:

- profileinformation
- images
- friendmapping

Table friendmapping

The "friendmapping" table stores the friends that are related to a specific feelingsweather.

The information stored in this table is the **feelingsweather** and a comma separated list of **friends** (userids) that are related to this weather.

This table is linked to the following tables:

- weather
- user

Table activitiesbyuser

The "activitiesbyuser" table stores the information about the activities a user planned in the weekplanner.

The information stored in this table is the **userid**, the **activityimageid** of the activities image in the image table and the **date** the user planned this activity.

This table is linked to the following tables:

- user
- images

Table assignments

The "assignments" table contains information about the assignments the user can download at the end of the first sessions.

The information stored in this table is a unique **id**, the **session** the assignment belongs to, the **name** of the assignment and the **file** path (relative to the application's root directory) of the assignment sheet to download.

This table is linked to the following table:

- profileinformation

Table mediamapping

The "mediamapping" table contains the information of all multimedia material used in MindBook. Here it is defined which session a media file belongs to, which sequence it belongs to and if it is the last media object in a sequence or not. Further the information about the next content is stored here (for example that a game starts after its introductory video).

The information stored in this table is a unique **id**, the **session** the media belongs to, the **sequence** number the media file has in the session, the **media path**, the **media type** (video, audio or image), the **last media** information and the information about the **next** content.

This table is linked to the following table:

- profileinformation

Table logs

The "logs" table is used to store information for the analysis of the user's behavior. The logging differs with respect to page tracking and link tracking. Page tracking logs the page that is called by the application whenever the user clicks a link, while link tracking logs a text defined in the program code whenever a user calls a subsite in the application.

The information stored in this table is a unique **id**, the **userid** the log belongs to, the **date**, the **time** and the **timestamp** of the log, the **path** (or predefined text) of the subsite, the **filename** (or predefined text) of the

subsite, the **friendid** and **friendname** if the profile of a friend is called and the **logtype** (page- or linktrack).

This table is linked to the following table:

- user

Table gamestatistics

The "gamestatistics" table stores information about the user's success in the application's games memory and video decision. This data is used by the psychologists to evaluate the improvement of the children's decisions.

The information stored in this table is a unique **id**, the **game** the data belongs to (either "memory" or "videodecision"), the **module** of the game (the video decision game actually has four modules following each other), the **userid**, the number of **tries** the user needed to end the game and the **date**.

This table is linked to the following table:

- user

Table videodecision

The "videodecision" table contains information about the video decision game, like the module, the attitude and the corresponding files.

The information stored in this table is a unique **id**, the **module**, the **attitude** of the video ("start", "positive", "positive2" or "negative"), the **videofile** path (relative to the "videos"-directory inside the "games"-directory) and a **preview text** that is shown next to the decision buttons.

This table has no links to other tables.

Table memory

The "memory" table contains the whole information about the memory game. This table defines the pairs and the particular attitude.

The information stored in this table is a unique **id**, the **module**, the **pair** the cards belong to, the **attitude** of the single card in a pair ("positiv" or "negativ"), the **text** (that is also spoken in the audio file) and the path to the **audiofile** (relative to the "sounds"-directory inside the "games"-directory).

This table has no links to any other tables.

4.5 Content

Up to this point this chapter dealt with the structure and the data storage within the application. In this section I elaborate on the application's content.

4.5.1 feelingsweather

As already mentioned above content shown in MindBook often depends on the feelingsweather. Therefore it is necessary to explain the feelingsweather a little bit more.

The feelingsweather is defined by the user at the beginning of each session. The user drags images from thundery to sunny to the dates. In the program this images are represented using the integers -3 to 3. For the representation of the content a baseline from all feelingsweather entries of the user is computed.

The formula for the baseline b computation is

$$b = (0.75 \times actualFeelingsWeather) + (0.25 \times averageFeelingsWeather)$$

where the "actualFeelingsWeather" is the weather for the actual date and the "averageFeelingsWeather" is the mean weather value from the beginning of the MindBook usage until the day before the actual date.

Dependent on the computed baseline weather in MindBook are:

- Add new friends
- Posting of feeds

The average weather over all values is used for the graying of the profile header image.

4.5.2 Feeds

The feeds posted on the users' pin board are predefined by the psychologists. In the actual version of MindBook are 32 feeds defined, of which 17 are in a positive mood and 15 are negative. It is dependent on the weather baseline how many feeds are posted and if they are positive or negative. If the feelingsweather baseline is neutral or better, friends post positive comments. If the baseline is in a bad mood, friends post negative comments.

The amount of feed entries is defined as follows:

- Average feelingsweather < -2 : 5-8 negative comments
- Average feelingsweather < -1 and ≥ -2 : 3-5 negative comments
- Average feelingsweather < 0 and ≥ -1 : 1-3 negative comments
- Average feelingsweather ≤ 1 and ≥ 0 : 2-5 positive comments
- Average feelingsweather ≤ 2 and > 1 : 5-8 positive comments
- Average feelingsweather > 2 : 8-10 positive comments

Furthermore the application ensures that positive comments are written by positive friends and negative comments are written by negative friends. If the feelingsweather baseline is greater than 0 positive friends post, if it is 0 than the neutral friends post and if the baseline is less than 0 the negative friends post.

To facilitate the use of MindBook for children in the early school age many of the feeds contain images that illustrate the written feed.

4.5.3 Friends

The friends in MindBook are purely virtual and defined by the psychologists. At all there are 97 friends defined in the current MindBook version. They are divided into 42 positive, 15 neutral and 40 negative friends. Each of them has an own profile with a profile image, a header image, personal information and hobbies that can be accessed by the user. Children cannot interact with the friends, they can only read the posts and can access the profiles of their friends.

4.5.4 Games

As mentioned above, in addition to the psychoeducational parts MindBook contains two games. Of course this games also follow therapeutical goals, however the children can play them and not only watch given videos or listen to audio files without any interaction.

The games encourage the children to participate and push the game history towards the goal.

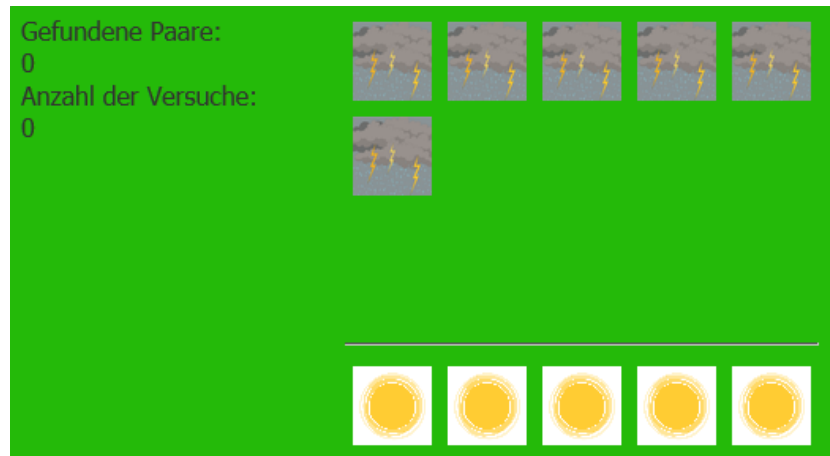


Fig. 4.15: The "Memory" game

Memory

This game is modeled after a well known children's game named "Memory". The goal of the game is finding pairs of cards and collecting them. The MindBook version of memory belongs to the MATCH module "Cognitive Coping - BLUE" and tries to enable childrens ability to replace negative with positive thoughts.

Therefore the pairs of cards consist of one positive and one negative thought that belong together and the children's task is to drag the negative thought above the corresponding positive one. The appearance of the cards is based on the feelingsweather - negative thoughts appear as a thunderstorm, positive ones as bright sunshine (see Fig. 4.15).

To identify correct pairs the user has to hover above a card or click it to start an audio file that expresses the thought. When a pair is combined correctly the player is rewarded with applause. When selecting a wrong combination a slightly "negative" sound is played and the negative card moves back to its starting point. The game ends when all negative thoughts are replaced by their positive ones, which means that all pairs have been found.

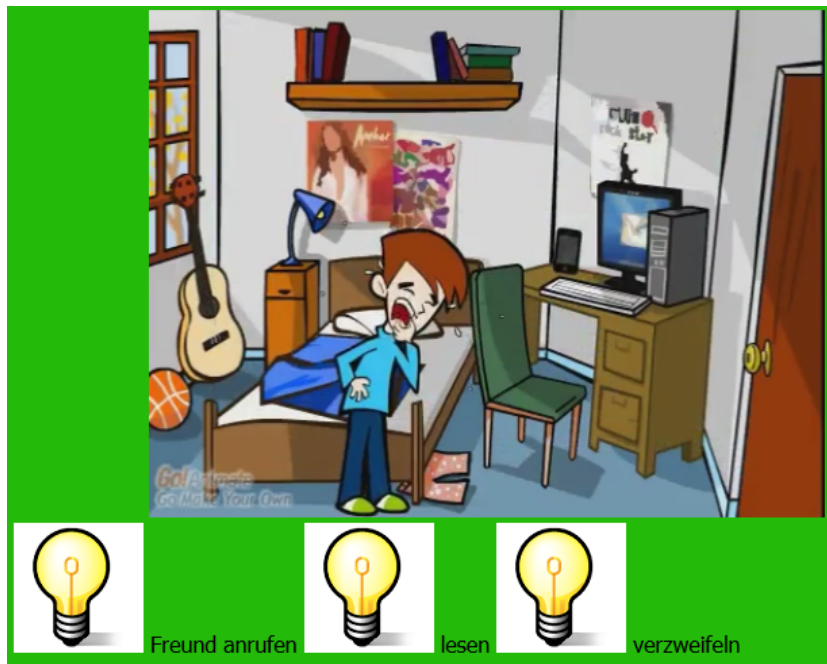


Fig. 4.16: The video decision game at the solution selection

Video decision

The second game belongs to the MATCH module "Cognitive Coping - TLC" and teaches children to find positive solutions for common problems. The first video of each sequence shows a problematic situation and following three possible solutions are provided (see Fig. 4.16). By clicking one of them the corresponding video is played. Two of the three solutions are positive, while one is negative. If the player chooses a positive end a congratulation appears and the next problematic situation starts. If the negative solution was chosen the player is encouraged to try it again and the initial situation is shown again. At all there are four situations shown and the game is over when all of them are solved in a positive way.

Chapter 5

Evaluation

This chapter deals with the evaluation of the MindBook application. It describes the usage and usability of the system by children in the age of the target audience. To retrieve the data two studies were executed. The first was conducted in cooperation between the psychologists and me with some school classes and the second one was made by me with a couple of voluntary children.

5.1 Psychological evaluation

The target of the first study was the investigation of the psychological effects to the children. This examination was made in cooperation with the psychologists with some voluntary classes in two schools. One investigation was made in an elementary school, the other in a high school. At all there were five appointments with each group, where in the first and the last appointment standardized psychological pre- and posttests were made. The first four dates were spent with the MindBook sessions, where the third and fourth session were linked together. The first MindBook session were held in

the first appointment after the psychological pretests. Each session lasts for 50 minutes, but the children where not forced to be online the whole time.

5.1.1 Experimental setup

The experimental setup differs in the schools due to the schools' technical equipment. In the high school the possibility to use the computer room was given. Therefore it was not necessary to create an extra experimental setup. The children used the computers available there.

The setup in the elementary school was much more complex. The first problem we faced was the fact that there was no Internet connection at this school. Further they had no computer rooms we could use. As a result I set up a local network with a MacBook Air as a local server and several iPads as clients. Therefore it was necessary to duplicate and adapt the whole MindBook application to the local server and set up the database and import the existing data.

On location the MacBook was configured as hotspot and the iPads were connected to this network. The children tested the application on the iPads, which gave us the possibility to see if the MindBook layout works on tablets.

Unfortunately it was not possible for me to be present at all tests due to scheduling overlaps. Sometimes the testings in the elementary and high school where at the same time. There I was present in the elementary school to look after the network. At the last appointment where the application was tested it was not possible for me to attend at all due to health reasons.

In this session by mischance it came to problems with the Internet at high school whereby the session could not be finished.

5.1.2 Results

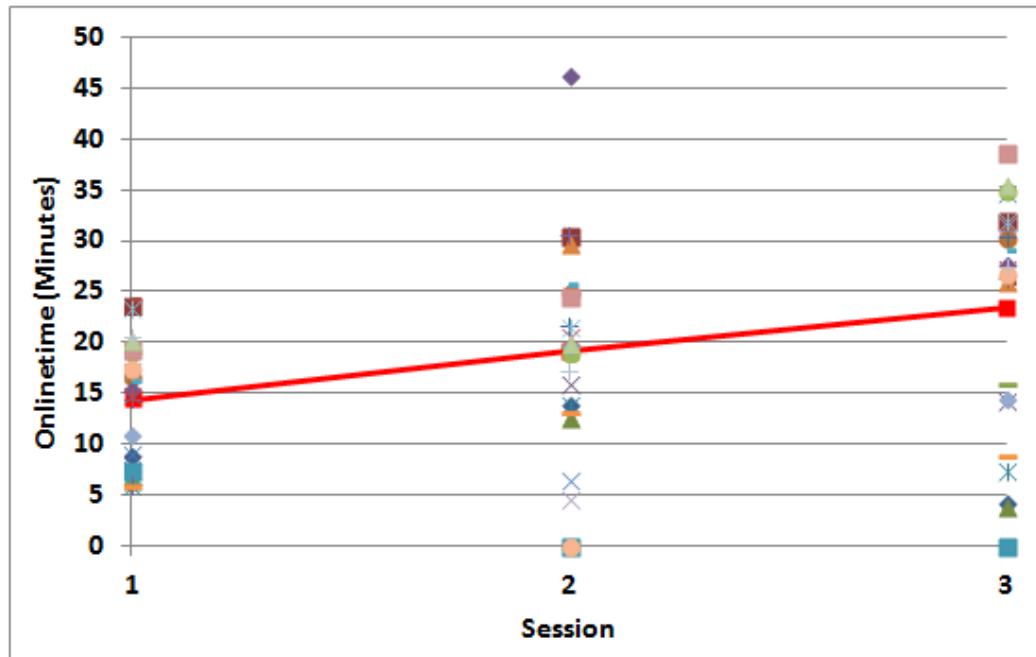
Unfortunately I do not have access to results from the psychologists evaluation. So I present some analysis from the first four sessions. The fifth session is ignored in this analysis due to the missing data of the high school.

Onlinetime

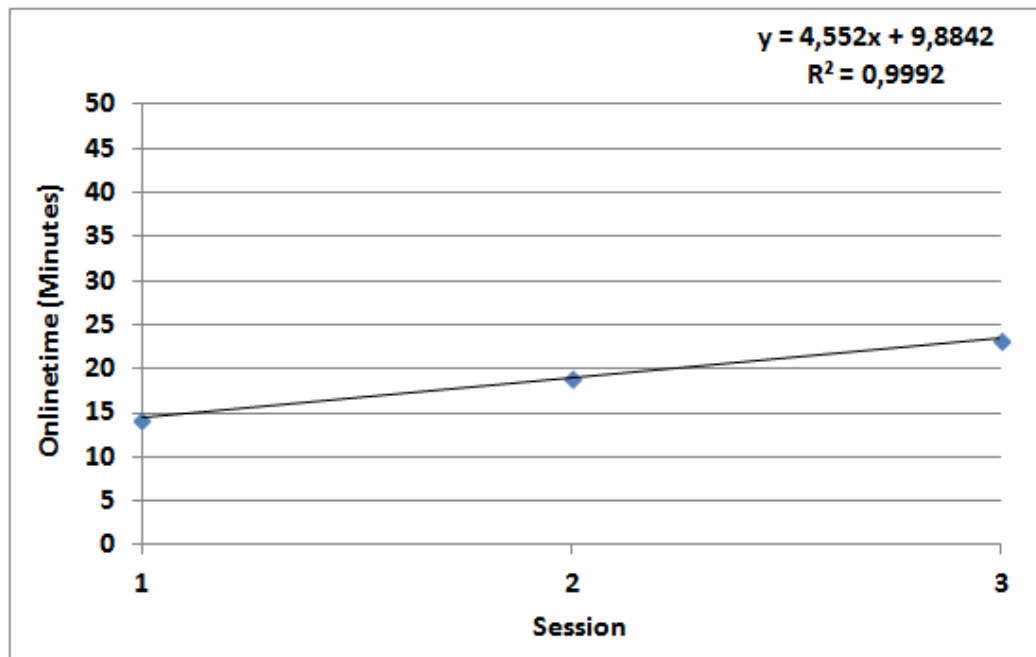
Figure 5.1 shows the online time per session for each user (see Fig. 5.1a) and in the mean (see Fig. 5.1b). As mentioned above MindBook sessions three and four were linked together due to better reconciliation with the schools. At all it can be seen that the onlinetime in the mean rises. This shows that the interest of the children grows with the use of the system. Of course the combined sessions three and four are more time consuming than the other two sessions but nearly every child had a longer online time in the second session than in the first. Furthermore the linear regression clearly shows an increasing online time (see Fig. 5.1b). The p-value for this regression is rounded 0.018. This shows that the increasing online time clearly correlates with the number of passed sessions.

Feelingsweather per date

The feelingsweather is an indication of the children's emotional state. Unfortunately children not always recorded the feelingsweather of the days between the appointments but this is fixed in the actual version of MindBook, so that the children can not progress without recording it. Figure 5.2 shows the data retrieved in the tests for all users (see Fig. 5.2a). Mostly the feelingsweather is in the positive half but there are also outliers in the negative half. But most children record a better feelingsweather at the end of MindBook usage than at the beginning. The regression for the feelingsweather was computed



(a) Online time of all users



(b) Mean online time with linear regression

Fig. 5.1: Online time per session (session 3 and 4 are linked together as one session)

on normalized values in the range from -1 to 1. Due to the high deviation of the single values we decided to compute the regression on squared function to investigate the tendency after some days of usage. Figure 5.2b shows an increasing tendency to the end of MindBook usage but the p-value of 0.1891 shows that there is no strong correlation between the duration of MindBook usage and an increasing feelingsweather-value. For further interpretation the results of the psychologists evaluation would be very interesting.

5.2 Usability evaluation

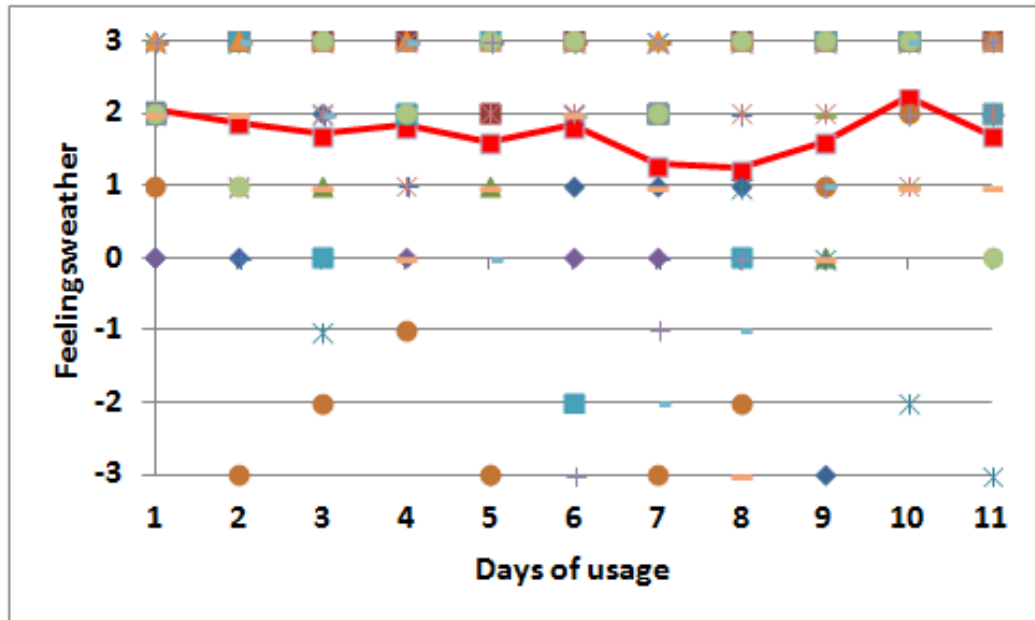
The usability evaluation was carried out by me with some voluntary children in the age of the target audience. This evaluation tries to figure out how easy and intuitive the system is to use. For this evaluation I worked together with a high school and a judo club where I was allowed to ask children for their participation.

5.2.1 Experimental setup and precognition

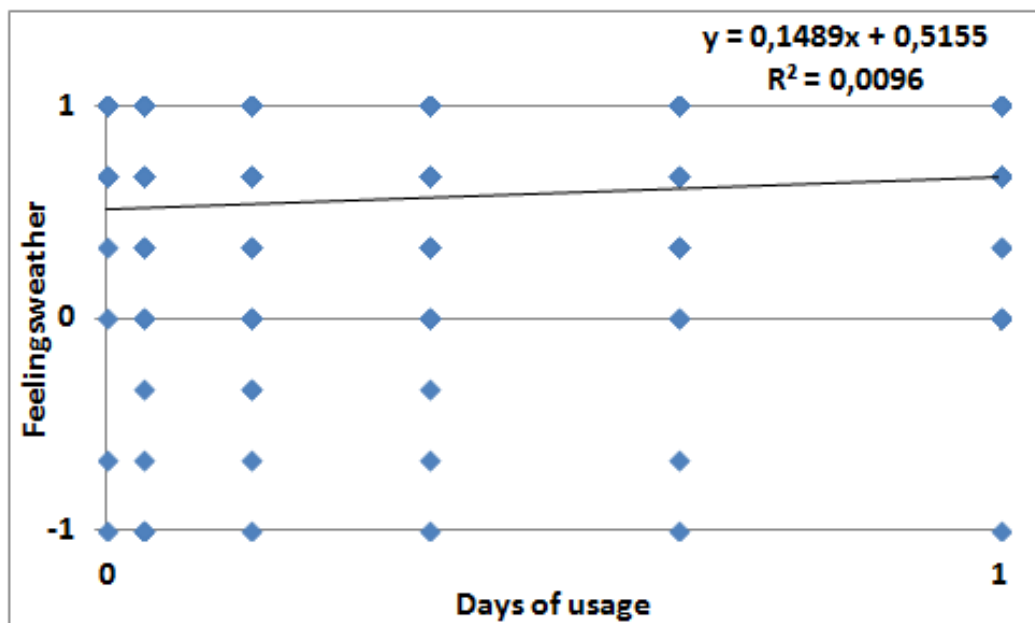
The children were tested on a notebook where they had to fulfill five tasks in the MindBook application. I observed them and took notes of their progress. Further I used a recording software that records the screen as well as the user via the web cam. This has the advantage that the reaction of the children can be seen on the video and the time taken for the tasks is also recorded.

The participants

The participants in the usability evaluation were children in the age of the target group. To cover a broader variety of age groups I have tested children in the judo club that are in elementary school as well as children from the



(a) Feelingsweather of all users



(b) Feelingsweather with linear regression

Fig. 5.2: Feelingsweather per date

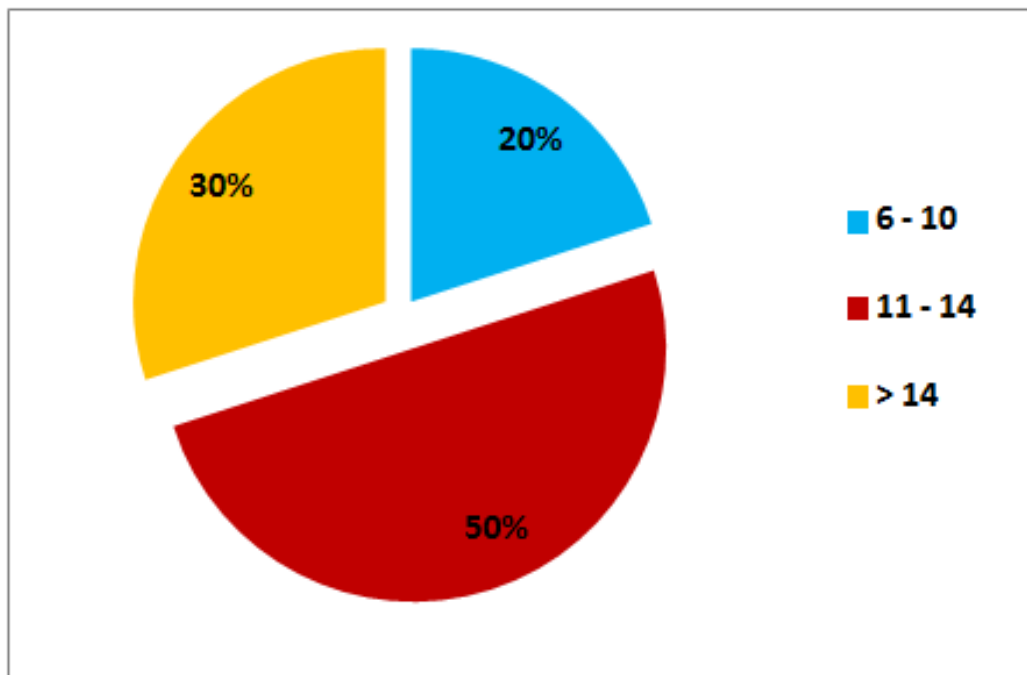


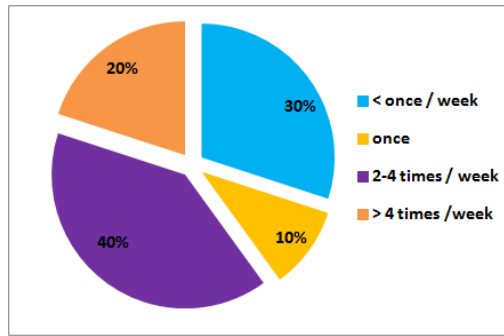
Fig. 5.3: Age distribution of the participants

high school. For the evaluation I divided the participants into three age groups: 6 - 10 years, 11 - 14 years and older than 14 years. Figure 5.3 shows the age distribution.

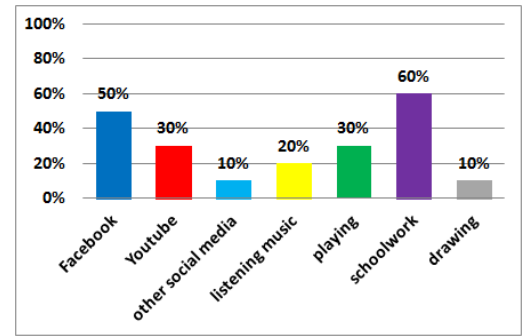
Previous knowledge

Of course previous knowledge influences the use and handling of the MindBook application. Therefore I asked for the frequency of computer usage per week, what the children normally do when they use a computer or the Internet at all, if they are experienced with Facebook and if they use it on their mobile phone or the computer.

The analysis of this data shows that the majority of the children is used to use computers in their daily lives (see Fig. 5.4a and Fig. 5.4b). The experience with Facebook is also rampant (see Fig. 5.5a). The bulk of

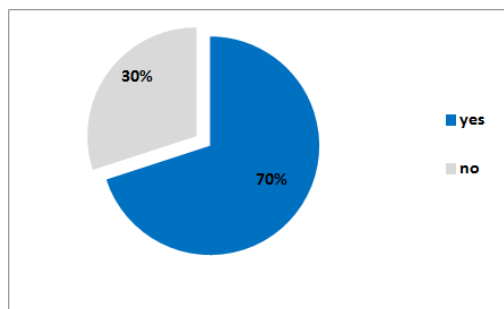


(a) Computer usage

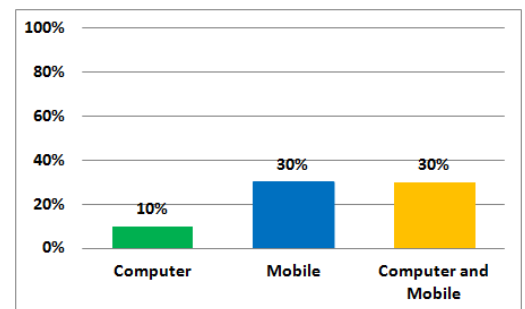


(b) Tasks fulfilled on the computer

Fig. 5.4: Participants and their computer experience



(a) Facebook experience



(b) Devices Facebook is used on

Fig. 5.5: Participants and Facebook

children without experience in social networks are from the age group 6 - 10 years. Further they use the computer for a variety of tasks, which suggests a broad base in dealing with different programs and their handling.

The usage of Facebook on mobile phones is widespread in the test group. The majority uses Facebook on their mobile phone or on the computer as well as on a portable device (see Fig. 5.5b). This fact suggests that the concept of touch surfaces is well known.

The tasks

All of the tasks could be met before or in the first MindBook session. This has the reason that the participants do not have existing accounts. The tasks are:

1. Create a user account
2. Login and fill in the login overlay
3. Plan a week
4. Set your hobbies
5. Return to the main page

With the exception of the item "Return to the main page" all the points are divided into sub-points, which should be recognized and fulfilled by the children themselves to achieve the goal of the task. In addition some operational issues were recorded. A sample of the recording sheet can be found in the Appendix.

To evaluate the usability of MindBook I want to answer the following questions:

- Handling
 - Is the given order of data input fields adhered by the child?
 - Is it obvious that always four profile images belong together?
 - Does the child autonomously click the buttons to progress (saving data, login)?
 - Is the meaning of the feelings weather in the login overlay obvious to the child?
 - Is the concept of "Drag and Drop" intuitive and if not is it necessary to show it or suffices an explanation?
 - How many hobbies are selected and if there are more than ten selected is it obvious that ten is the upper limit?
- Videos
 - How long do the videos need to load?
 - Does the child watch the videos attentive?
 - Tries the child to skip the videos?
- Time
 - How long does it last until the child finds the correct link?
 - How long does the child need to fulfill all tasks (without watching videos)?
 - How much time is spent watching videos (incl. waiting to load them)?

5.2.2 Results

In the results section I would like to figure out possible problems in the usability. I follow the grouping in the list above to ensure a better overview.

Handling

At the beginning I will present the results of the handling issues. This covers everything the children have to do and shows if the tasks are understood correctly. Figure 5.6 shows the results of the single issues.

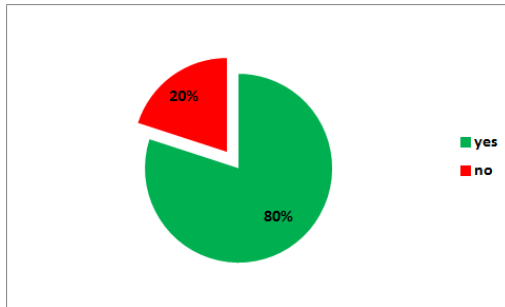
- **Input order:** First I observed if children follow the given sequence of fields to input data. This observation was made in the registration process and during the login. At the account registration 80% of the children followed the given order (see Fig. 5.6a), whereas at the login 100% adhered the order of "Username" and "Passwort".
- **Profile images:** The second issue observed during the registration process was if children recognize that the four profile images in a row belong together and can be selected via the radio button on the left side. 60% of the participants were aware of that fact, whereas the other 40% needed a hint to select their profile image (see Fig. 5.6b).
- **Autonomous saving:** The next point observed answers the question if it is obvious to the children that all of the tasks mentioned above except of the last one ("Return to the main page") have to be finished with saving the inserted data.

Figure 5.6c shows that three out of five necessary confirmations were made autonomously by 100% of the participants. At the account creation 20% and at the weekplanner 30% ignored the saving until they

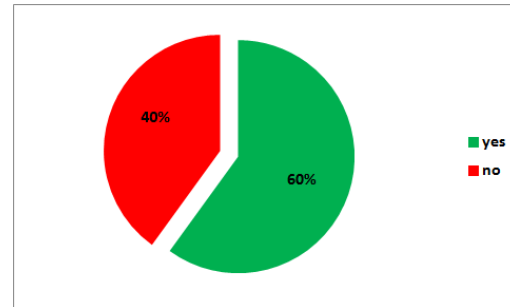
were requested to do so. The 20% at the account creation where the youngest participants and overlooked the save button. The 30% at the weekplanner have not scrolled down the window, so they have not seen the button to save the weekplan.

- **Drag & Drop:** Another very important question was, whether the concept of "Drag & Drop" is intuitive to the children. Due to the fact that this concept is more common on mobile devices than on the computer, 50% of the children needed help in the login overlay. In the weekplanner, where drag and drop is used to plan the week the concept was clear to 90% of the children (see Fig. 5.6d). In 60% of the cases where the use of drag and drop was not clear an explanation suffices to help the children to fulfill the task. The other 40% needed a demonstration (see Fig. 5.6e).
- **Hobbies:** In the fourth task I was interested if the children find the site in MindBook where they can select their hobbies, how many hobbies they will select and if it is obvious that ten hobbies is the upper limit for this selection. 90% of the participants identified the profilepage as correct place to set their hobbies. The other 10% needed a hint to find the page.

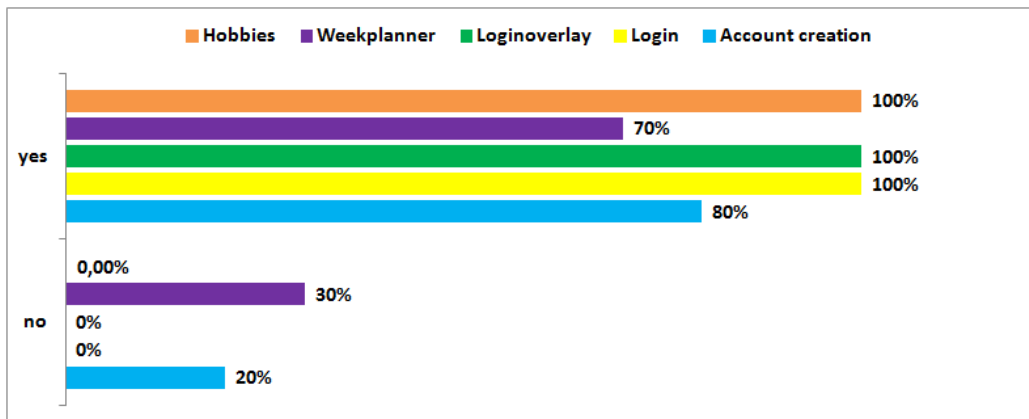
Figure 5.6f shows how many hobbies are selected by the children. For the 20% that selected ten hobbies it was obvious that this is the upper limit.
- **Feelingsweather:** Further I was interested if the meaning of the feelingsweather is obvious to the children. It turned out that the presentation is self-explanatory and there were no questions what this pictures mean and what to do with them.



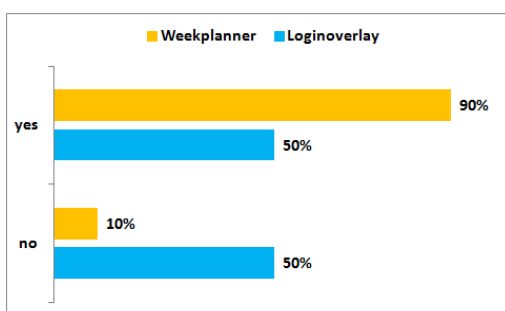
(a) Following input order at registration



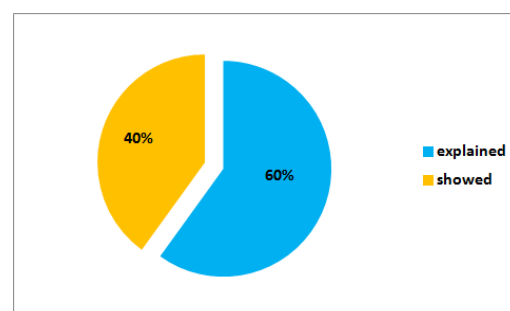
(b) Profile images belong together



(c) Is data saved autonomous

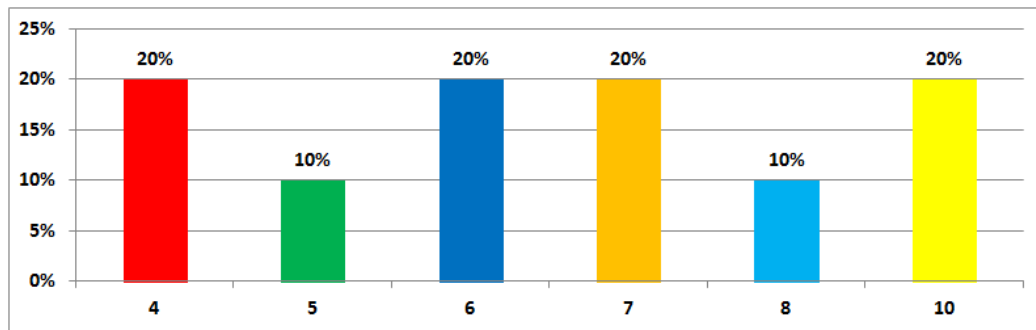


(d) Is Drag & Drop intuitive



(e) Drag & Drop explained or showed

Fig. 5.6: Handling issues



(f) Number of selected hobbies

Fig. 5.6: Handling issues (continued)

Videos

Also very interesting is if the children watch the videos attentively and if they try to skip them or not. This is important due to the fact that, especially in the second video, the content of the videos helps the children to fulfill the tasks. Another point I observed was the loading time of the videos, because this also can influence a child's attention.

- Loading time:** Of course loading times of the videos depend on the Internet connections. I have tested in different environments and used data connections via mobile phone as well as WiFi connections. Interestingly mobile connections were not the slowest. The WiFi in the highschool produced 100% of the slowest loading times. An overview over the loading times can be seen in Figure 5.7a. The range between the fastest and the slowest loading time compared over all three videos is 04:05 minutes. So the fastest loading time is 2.39% of the slowest loading time.
- Video attention:** As mentioned above the videos provide information about the upcoming tasks to the children. So it is necessary to watch the videos attentively because the more attentively a video is watched

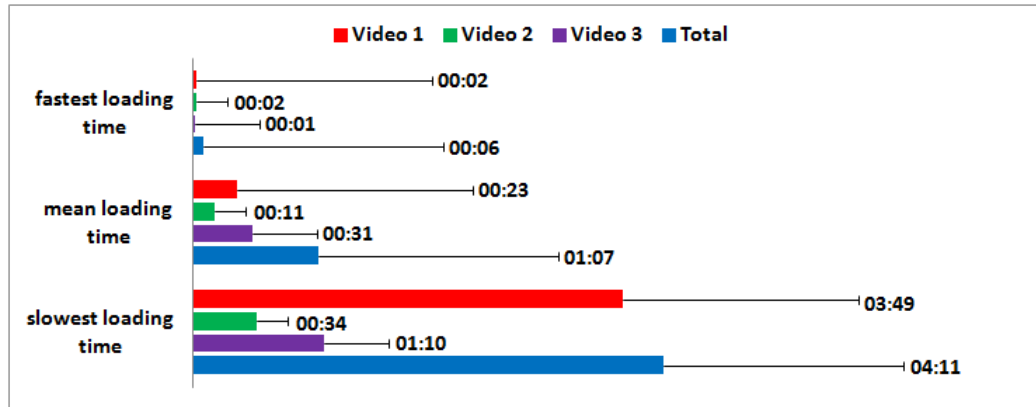
the easier the task is fulfilled. The results of this inspection are split into the age ranges mentioned above. Figure 5.7b shows that particularly the video before the hobby selection is watched less attentively than the other ones. Further it can be seen that the children in the age from 6 to 10 are the most inattentive in sum. A reason for the significant inattention at the last video could be the duration of the video.

- **Video skipping:** As already mentioned in the implementation part skipping of videos on computers is not possible, so that the children have to watch them. Nevertheless I have observed if the children tried to skip the videos or not. Surprisingly there were only a very little number of 10% of the participants who tried to skip the video and this only at the second video (see Fig. 5.7c).

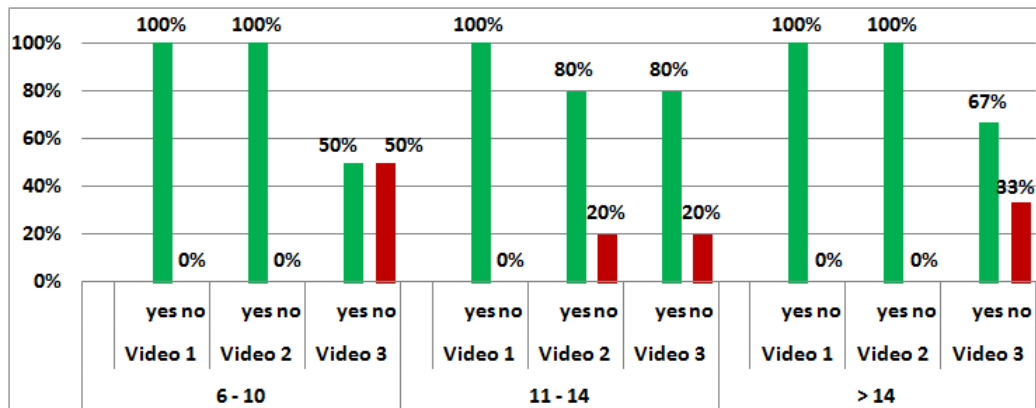
Time

Also interesting for the evaluation is the question how long the children need to fulfill the tasks. Figure 5.8 gives an overview over the consumed time grouped by age. The figures show the minimum (see Fig. 5.8a), the mean (see Fig. 5.8b) and the maximum (see Fig. 5.8c) times needed and picture the time searching and clicking links, working without the time consumed watching videos, the total time watching videos, the total time to fulfill all tasks (total time working) and the whole time including the announcement of the tasks.

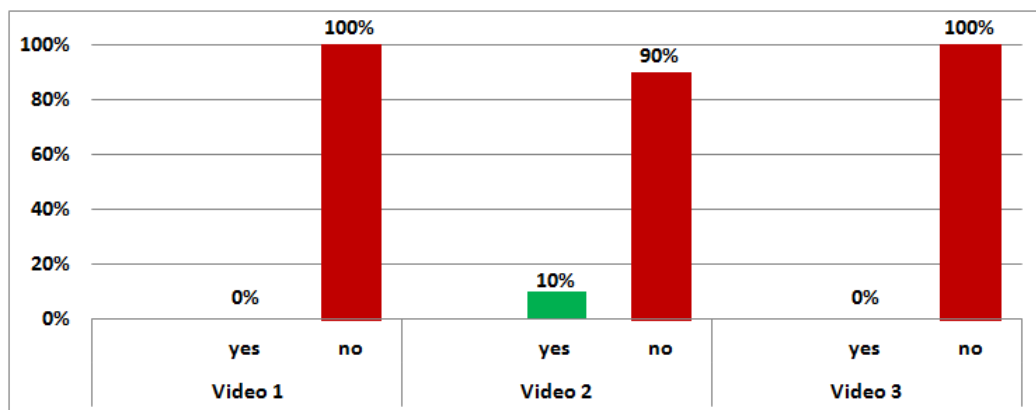
Taking into account that the majority of the age group 11 - 14 were tested in the highschool with poor video loading times in all of the mentioned points it is obvious that the age and the speed of completing the tasks relate to each other. The older the children are, the faster they were finished.



(a) Loading time of the videos



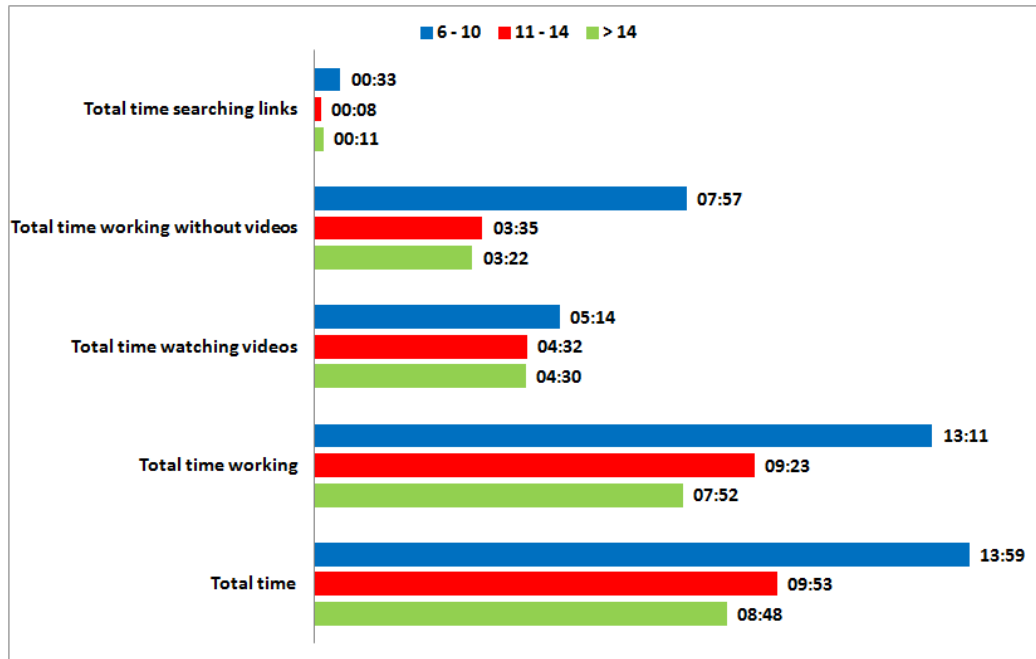
(b) Attention in watching the videos



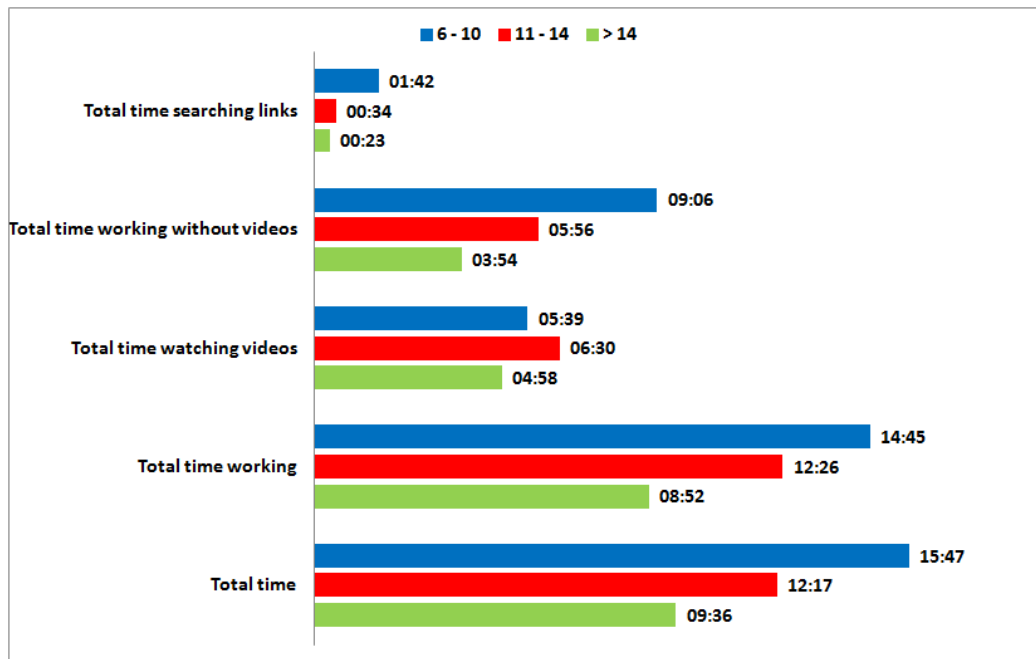
(c) Tries of skipping

Fig. 5.7: Video issues

- **Find and click the correct link:** Finding the correct link is important to progress with the tasks. With the exception of the participants who did not follow the introductory video (video 2) attentively, none of the children had problems finding the correct link. The slightly longer time of the age group 6 - 10 is due to the unconfident handling of the mouse.
- **Time to fulfill all tasks:** This point shows the time children needed to fulfill all tasks minus the time needed from the tester to announce the tasks. This also depends on the video loading time, therefore the graph also pictures the time working without watching videos. This clearly shows that the experience with computers is advantageous for the use of MindBook but not necessary.
- **Time watching videos:** This graph shows the time the children spent on watching the videos respectively waiting for them to be loaded.
- **Difference between slowest and fastest:** The greatest difference between the slowest and the fastest working time without watching videos is found in the age group 11 - 14 (see Fig. 5.8d). In my opinion this is on the one hand due to the experience with computers and on the other hand due to the difference in attention span. In this age group the children gain a lot of new experiences and learn to focus on one task.

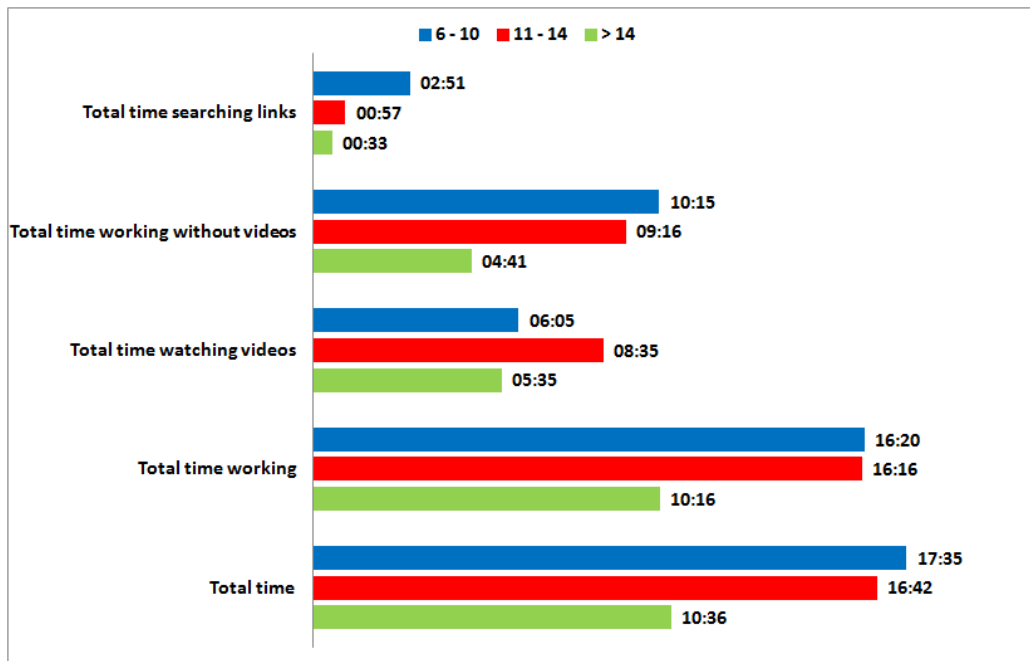


(a) Minimum time

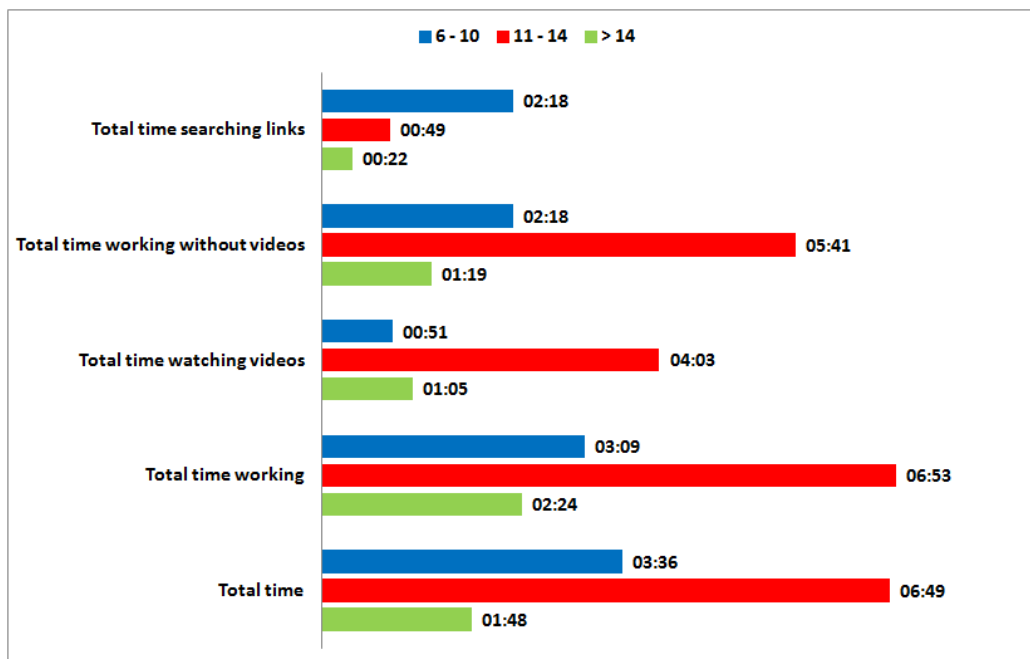


(b) Mean time

Fig. 5.8: Time consumed per age group



(c) Maximum time



(d) Difference between maximum and minimum time

Fig. 5.8: Time consumed per age group (continued)

Chapter 6

Further Improvements

For widespread use some more tests and improvements would be useful. Due to the missing data from the psychological tests the suggested improvements are based on the usability tests.

As the tests showed the use of drag & drop on computers is not as intuitive as expected. Therefore it would be useful to integrate an introductory video in the style of the application to drag & drop before the login overlay appears the first time. This video might be limited to the use of MindBook on computers, due to the fact that this operating concept is much more intuitive and common on mobile devices.

Further the study revealed that video loading is very time consuming if the Internet connection is slow. Hence videos might be preloaded. This could be implemented easily by adding the "preload" attribute to the video tag, however it would be wise to have a close look at this due to the possible mobile use of MindBook and the resulting data limits.

Not as a results of the tests but also interesting would be the expansion of the application to further diseases. In this version, the content of MindBook is tailored to the clinical picture of depression. However the foundation for the expansion has been laid with first approaches of implementation for children with eating disorders. MindBook allows to import friends and feeds for the therapy of depressiveion as well as for eating disorders.

The extensions to be made for this would be new games and therapy videos, because they all fit to depression therapy.

Chapter 7

Conclusion

The goal of this thesis was the development of an application for the prevention and therapy of depression in childhood and adolescence in cooperation with the Institute of Clinical Children and Adolescent Psychology. As social networks are widely used nowadays I had the requirement to design a platform similar to Facebook. First we considered about a Facebook application but then decided against due to too many unswayable factors. Friends cannot be controlled on Facebook by the psychologists and therefore I've developed a stand alone platform. To make it as portable as possible we decided to implement the application as a web site.

The application is aiming to show children that feedback is more positive, if they present themselves in a positive way. To find out the children's current feeling we have discussed different ways and agreed on a presentation as "feelingsweather", where the children classify their mood using thundery to sunny symbols. Depending on this information and the feelingsweather recorded since the first use, the application computes a baseline and chooses, depending on that baseline, the friends and the postings the child sees. These friends and posts are all virtual and composed by the psychologists.

The first five sessions contain therapeutical videos and explanations where the children learn to use the platform and should be conducted under medical attendance. These sessions are designed in a way that a early exit is not possible so the children have to follow the therapeutical content. After these five sessions they can decide on their own, when they like to leave.

To provide not only therapeutical content as a kind of frontal lecture games and tasks with therapeutical effect are also integrated.

In the future children and adolescents should be able to use MindBook on their own from home and search help in the therapeutical tools provided on the site. Technically it also may possible to expand it to further diseases.

Appendix

Zusammenfassung

Abstract: Diese Arbeit zeigt die Idee und Erstellung eines "Therapeutisches Soziales Netzwerk", welches gemeinsam mit dem Institut für klinische Kinder- und Jugendpsychologie der Universität Wien entwickelt wurde. Die Plattform namens "MindBook" ist eine Webapplikation, die Kindern und Jugendlichen mit Depressionen aufzeigen soll, dass eine positive Selbstdarstellung zu positiverem Feedback führt, als eine negative Selbstdarstellung. Auch ein präventiver Einsatz der Anwendung ist möglich. MindBook ist in PHP programmiert und nutzt weiters HTML5, CSS, jQuery und MySQL.

Soziale Netzwerke wie Facebook und Co. sind in der heutigen Zeit nicht mehr aus dem Alltag wegzudenken. Vor allem Kinder und Jugendliche nutzen die neuen Techniken um immer auf dem Laufenden zu bleiben. Doch leider bieten diese Plattformen nicht nur großes soziales Potential, sondern bergen auch einige Risiken, die gerade Kindern und Jugendlichen oft schwer zusetzen können. Oftmals werden junge Menschen zu Opfern sozialer Ausgrenzung. Nicht selten passiert das Personen, die sich selber nicht allzu positiv präsentieren und ohnehin schon Selbstzweifel hegen.

Diese Tatsache führte zu der Idee ein "Therapeutisches Soziales Netzwerk" für Kinder und Jugendliche zu erstellen, wo sie in einer Umgebung ähnlich einem sozialen Netzwerk lernen können, dass eine positive Selbstdarstellung auch positivere Rückmeldung der Umwelt nach sich zieht, als eine negative Selbstdarstellung. Dieses therapeutische soziale Netzwerk trägt den Namen MindBook und wurde in Zusammenarbeit mit dem Institut für klinische Kinder- und Jugendpsychologie der Universität Wien entwickelt und getestet.

Optische ähnelt die Plattform Facebook, da es den Kinder und Jugendlichen das Gefühl geben soll, sich in einem sozialen Netzwerk zu bewegen. Inhaltlich basiert MindBook auf rein virtuellen Freunden und Beiträgen, die von den Psychologen entwickelt wurden. Die Stimmung der Benutzer wird zu Beginn jeder Sitzung anhand einer "Gefühlswetter"-Skala abgefragt und bestimmt die Freunde und Inhalte, die dem Benutzer präsentiert werden. Je positiver die eigene Einstellung ist, desto positiver sind die Freunde und ihre Pinnwandbeiträge.

Weiters werden den Kindern und Jugendlichen laufend Werkzeuge an die Hand gegeben, mit Hilfe derer sie lernen, negative Gefühle besser zu bewältigen. Die ersten fünf MindBook-Sitzungen sind mit der Einführung neuer Werkzeuge und Techniken gefüllt, die auf einem funktionierenden psychologischen Modell namens "MATCH-ADTC" beruhen. Im Anschluss an diese ersten fünf Einheiten können die Kinder und Jugendlichen das System vollkommen frei benutzen und jederzeit bei Bedarf auf die Werkzeuge zurückgreifen.

Summary

This thesis presents the idea and implementation of a "Therapeutical Social Network" developed in cooperation with the Institute of Clinical Children and Adolescent Psychology of the University of Vienna. This platform named "MindBook" is a web application that shows children and adolescents with depression that presenting themselves in a positive way leads to more positive feedback than being negative. This application can also be used preventively. MindBook is programmed in PHP and uses HTML5, CSS, jQuery and MySQL.

Social networks like Facebook are commonplace. Especially children and adolescents use these new techniques to be up to date. However these networks do not only have great social potential, but also involve risks of social exclusion or bullying. Frequently this happens to children and adolescents that are already doubtful and not very confident.

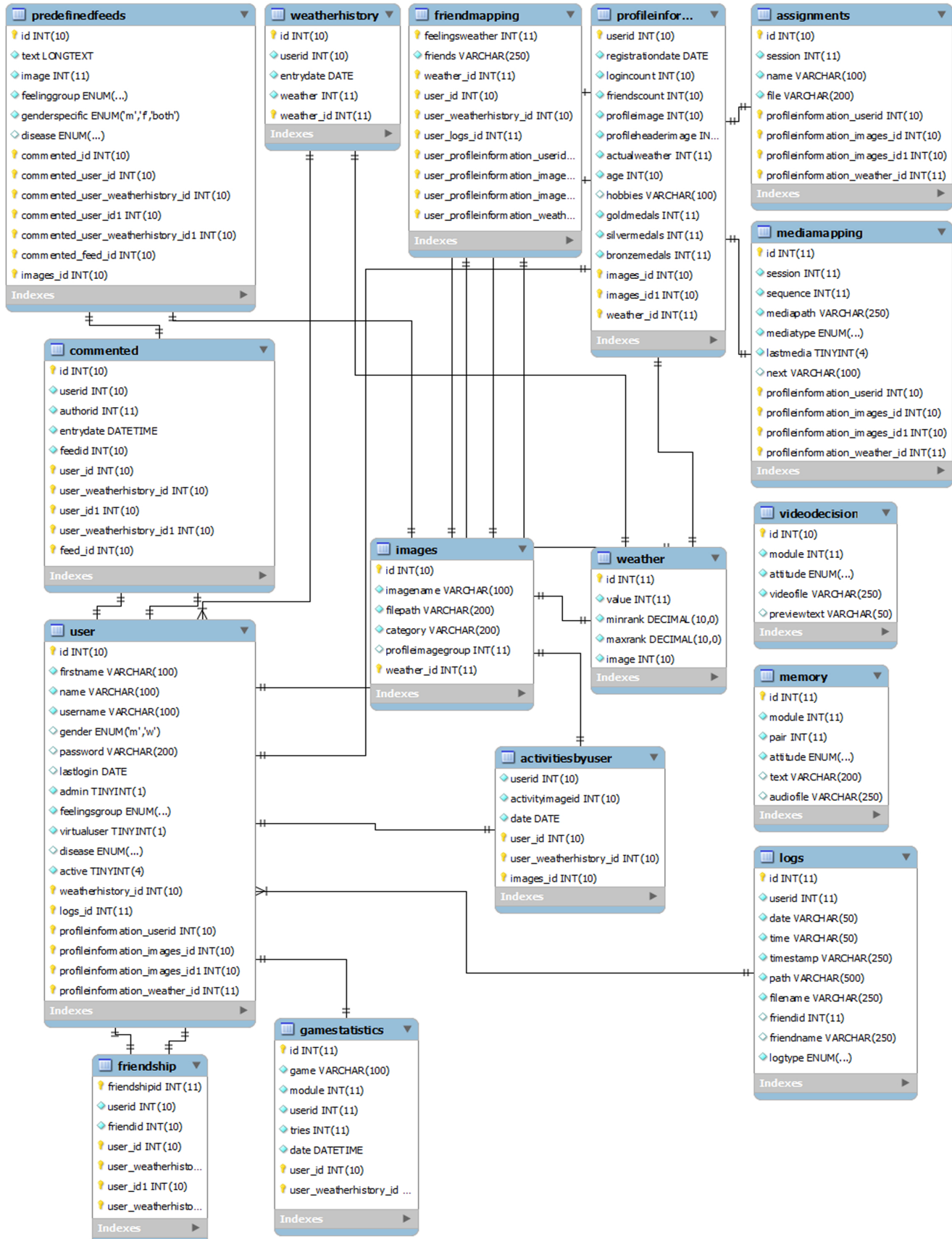
This fact led to the idea to develop a "Therapeutical Social Network" for children and adolescents, where they can learn in a social network-like environment to present themselves in a positive way and that positive self-expression leads to more positive feedback than negative self-expression. This therapeutical social network named MindBook was developed and tested in cooperation with the Institute of Clinical Children and Adolescent Psychology of the University of Vienna.

The optical appearance of the platform is similar to Facebook to give the children and adolescents the feeling to act in a social network. However, the content of MindBook is purely virtual and the friends and posts are all designed by the psychologists. The users' mood is requested at every login

in form of a "feelingsweather"-scale and influences the friends and the posts the system presents the user. The more positive the self-expression of the children is, the more positive the friends and their feed posts are.

Further the children and adolescents learn about different strategies to cope with negative feelings. The first five MindBook sessions are filled with the introduction of new techniques and tools that are based upon an established psychological framework named "MATCH-ADTC". After the first five sessions the children and adolescents can use the system as they like and access the tools introduced in the first five sessions whenever they like.

Detailed diagram of the MindBook database



Usability questionnaire

MindBook - Usability test	Name:	Age:	Date:
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How often a week do you use a computer? ☐ once ☐ 2 – 4 times ☐ more than 4 times

Are you already experienced with Facebook? ☐ yes ☐ no

What do you normally do, when you are using the computer?

Recording sheet

1) Create an user account

Follow link on the loginpage

Watch video

Tries the child to skip the video? ☐ yes ☐ no

Data input

Does the child use mouse or tabulator? ☐ mouse ☐ tabulator

Is the given order adhered?

First name	
Surname	
Username	
Password	
Retype password	
Gender	
Age	
Select profile image	
Select title image	

Is it obvious that always four of the profile images belong together?

☐ yes ☐ no

Does the child save the user account autonomous?

☐ yes ☐ no

2) Login and fill in the login overlay

1. Does the child fill in the username and the password in the given order?

Username	
Password	

2. Does the child login autonomous?
- ☐
- yes
- ☐
- no

3. Loginoverlay

- 3.1 Is the meaning of the feelings weather obvious?

☐ yes ☐ no

- 3.2 Is “drag & drop” intuitive?
- ☐
- yes
- ☐
- no

If not, is it necessary to demonstrate it or suffices an explanation?

☐ demonstration☐ explanation

- 3.3 Is the overlay confirmed autonomous?
- ☐
- yes
- ☐
- no

4. Is the following video watched attentive?
- ☐
- yes
- ☐
- no

- 4.1 Tries the child to skip the video?
- ☐
- yes
- ☐
- no

3) Plan a week

1. Open the weekplanner by clicking the calendar symbol

2. Plan the week with “drag & drop”

- 2.1 Is the “drag & drop” intuitive?
- ☐
- yes
- ☐
- no

- 2.2 Is the planned week saved autonomous?
- ☐
- yes
- ☐
- no

4) Set your hobbies

1. Open profilepage by clicking the profile image

2. Is the following video watched attentive?
- ☐
- yes
- ☐
- no

Tries the child to skip the video? ☐ yes ☐ no

3. Select hobbies

- 3.1 How many hobbies are selected?

- 3.2 Is it obvious that maximum 10 hobbies can be selected?

☐ yes ☐ no

- 3.3 Are the selected hobbies stored autonomous?

☐ yes ☐ no**5) Return to main page**

Click the “MindBook”-logo to return to the mainpage

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