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Abstract

New technologies like smartphones or tablets revolutionized the way we live and learn. Especially the thinking patterns of the young generation changed. Given that, they learn often online, new technologies need to be integrated into classrooms to enhance traditional teaching methods. In combination with gamification, the learning contents can be enhanced and thereby raise the motivation of students.

This thesis describes the developed e-learning tool Story Templates, which was created to motivate students to repeat learning content and to strengthen their reading competence. The students should be motivated through stories, the use of new media and the embedded gamification. The tool offers teachers the possibility to include stories into the daily homework assignments. The main idea is to insert learning content meaningful into exciting stories in form of tasks. Each story has its predefined breaks, where different tasks can be inserted, for example an arithmetic problem. With a webpage, the teacher can create and send stories to classes. For reading the stories and providing answers, the students get a mobile application on their smartphones or tablets.

We carried out an experimental evaluation to test if Story Templates motivates students to repeat learning content by using stories on digital devices. The results showed that the majority had fun and enjoyed time on Story Templates. It turned out that the main motivational factor is the usage of digital devices or computers in combination with entertainment. The majority of participants wanted to solve such tasks again, which lets us suggest that Story Templates motivates students to repeat learning content.

Zusammenfassung

Neue Technologien wie Smartphones oder Tablets haben unsere Art zu leben und zu lernen revolutioniert. Vor allem die Denkweisen der jungen Generation haben sich verändert. Da sie immer häufiger online lernen, sollten neue Technologien in den Lernunterricht integriert werden, um alte Lernmethoden zu verbessern. In Kombination mit Gamifizierung kann neue Motivation für Schüler geschaffen werden.

Diese Arbeit beschreibt das E-Learning Tool Story Templates, welches entwickelt wurde um die Lernmotivation von SchülerInnen zu steigern und ihre Lesekompetenz zu stärken. Die SchülerInnen sollen mit Hilfe von Geschichten und dem Nutzen von neuen Technologien, in Kombination mit Vergnügen, motiviert werden. Das Tool bietet Lehrern die Möglichkeit Geschichten in die täglichen Hausübungen zu integrieren. Die Idee ist, Lerninhalte sinnvoll in aufregende Geschichten, in Form von Aufgaben, zu integrieren. Jede Geschichte hat dabei seine vordefinierten Lücken, in die Aufgaben eingefügt werden können, zum Beispiel ein arithmetisches Problem. Mit Hilfe einer Webseite können Lehrer diese Geschichten erstellen und an ihre Klassen versenden. Um die Geschichten zu lesen und die Aufgaben zu lösen, stehen den SchülerInnen eine mobile Applikation auf ihrem Smartphone oder Tablet zur Verfügung.

Wir haben eine experimentelle Evaluierung durchgeführt, um zu testen ob Story Templates mit Hilfe von Geschichten auf digitalen Geräten Schüler motivieren kann Lerninhalte zu wiederholen. Die Ergebnisse haben gezeigt, dass die Mehrheit der Testpersonen Spaß hatte und die Zeit auf Story Templates genossen hat. Es hat sich herausgestellt, dass der Hauptmotivationsfaktor die Benutzung der digitalen Geräte, in Kombination mit Unterhaltung, ist. Die Mehrheit der Testpersonen hat angegeben diese Aufgaben wieder lösen zu wollen, was uns daraus schließen lässt, dass Story Templates motivieren kann Lerninhalte zu wiederholen.

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1 Introduction

Our modern world cannot be imagined without computers, phones or tablets. Especially the youth's lives are strongly affected by digital media. Young people in the USA use digital media about 7.5 hours a day every day [1]. The excessive use of new media changed the way the new generation thinks and especially learns. The new generation, also known as Generation Z, grew up with digital technologies and has no troubles working with them.

Today's students are bombarded with information. They get input from videos, images or texts from multiple sources simultaneously. Furthermore, they expect fast feedback and response. New technologies and the Web 2.0 offer new opportunities to learning. There are big changes occurring across our learning ecology and current methods need to be adopted.

Traditional learning methods focus on reading books, which is outdated for most of the students of the new generation. Everything needs to be scrollable and available on screen to get their attention. To raise their motivation, the learning methods need to be extended with new ideas and technologies. A diversified education brings back curiosity and motivation to the classroom. With new media literacy, education can be more versatile and modern. Liked figures, characters or the context should be viewed on different media to enable diversified teaching. The book as media can be supplemented through digital media, like tablets or smartphones etc. [2]. The new digital media gives children with lower reading competence a new incentive to read [3].

Given that, new media can motivate children to read and learn, this master thesis presents the e-learning tool "Story Templates" for children in elementary school. The goal is to motivate students to repeat learning content and simultaneously strengthen their reading competence by using digital media. Story Templates is an easy to use tool for both users, teachers and students. The tool provides a simple website for teachers and a mobile application for students.

As a child everyone loved hearing or reading fairy-tales and exciting stories. Story Templates benefits from this positive associations and uses stories as a core

motivational factor. The tool offers narratives which are created by the teacher, where tasks of the actual learning content are integrated meaningful. We added gamification to the student's application to make it fun and not only serious. The student is guided through the application with the help of the main character "Filou" and his friends. By solving the tasks, the student helps him to find a mysterious treasure. Through competition and success, playing Story Templates should be fun and keep the attention of the student.

The goal of this thesis is the development of an additional tool for education which motivates students to read and learn, with the help of stories on digital devices.

Overview

In Chapter 2 we describe related work and present already existing tools, which focus on stories as motivational core factor. Further we discuss some tools which focus on the creation of individual educational games. In Chapter 3 we discuss the fundamentals of different topics Story Templates addresses. Important terms are introduced and explained by various literature.

In Chapter 4 we describe all frameworks and tools which were used for developing Story Templates. In the following Chapter 5, we carve out the functionalities and the usage of Story Templates. The whole tool is explained and visualized by figures. Furthermore, the architecture and the implementation of the tool are described. In Chapter 6 we explain the evaluation process of Story Templates and discuss the results. In the end we talk about conclusions and future work.

2 Related Work

The new generation was born into a fast-growing technological world and is used to modern media. They are always up to date and spend a lot of time with their digital devices. Not only their behavior changed, but also their thinking patterns [4]. With this, education needs to be adapted for this new generation. 70% of students between 14 and 19 wish for more usage of digital media in school [5]. On the other hand, they do not think that digital media can replace traditional school books. This shows that digital media should extend the conventional teaching methods, but not replace them. One of the big problems for integrating digital media into classrooms is that a lot of teachers do not have the competence to interact with them. About 80% of the students think that teachers need to be better trained for the use of digital media [5]. This shows that there is a need for introducing teachers to new technologies and to help them to keep up with the new generation.

Although almost every teenager owns a smartphone, reading a book is not outdated. Especially girls like to read: 59% between 12 and 14 years like to read books [6]. In contrast to the total population, teens from 15 to 19 do not read daily, the majority reads at least once a week [7]. Reading is an essential skill which should be strengthened in early years of education. Motivation and competence in reading are closely related. When readers are motivated, they read a lot more and develop different reading strategies [8]. This leads to the conclusion that the reading competence can be strengthened by raising the reading motivation. Children can be motivated by getting positive feedback about their reading competence [8]. Stanovich [9] proved that children unmotivated to read, subsequently have a smaller reading competence. On the contrary, children motivated to read have a bigger reading competence, as they have a bigger word pool and a better text understanding. Furthermore, he pointed out that the gap between motivated and unmotivated readers increases more and more if unmotivated readers cannot be motivated. To avoid this development, readers with low reading competence should be supported and motivated to read.

But motivating someone is not that easy, it needs a motivational factor. This could be realized by exciting stories, rewards, games or the use of digital media. Especially the use of digital media can help to get new motivation. There are plenty of existing tools

which use this approach. One of them is the online platform Antolin [10]. It is a web based German reading platform for children and teenager, which focuses on strengthening their reading skills. Children are encouraged to check their reading comprehension with the help of questions about books they read. The database includes 10 000 books and 10 to 16 questions, with different levels of difficulty, for each of them. User can create questionnaires about children's or teenager's books. Depending on the size of the questionnaire, it is divided into two levels of difficulty. If a child is reading a book where no questionnaire is available, it is possible to create one by itself or by its parents. By creating it, the reading comprehension of the students can be checked. To have an overview about the development of the students, the teacher gets online feedback about the activities of them. They get a list of all read books, but also information about the test results. The teacher can communicate with the students with the help of a mail box. Students get rewards in form of points, certificates or medals. The combination of new media and gamification motivates students to read at home by choice and not by order.

Another platform which also focuses on improving the reading skills of students is Onilo [11]. It is a platform for schools and other educational facilities which provides contents for strengthening the reading skills and for knowledge transfer. It focuses on popular and successful picture and children's books which are pedagogical conditioned. The core idea of Onilo is the use of the so called "Boardstories". These are picture books or illustrated stories which are digital edited with special technologies to be used on interactive whiteboards or projectors. For each "Boardstory", a teaching concept is developed which allows to enrich the story with interactive teaching material.

Stories can be a strong motivational incentive for students. Everybody likes to hear or read exciting stories. Especially children love storytelling, which helps them to evolve creativity and imagination. There are some educational tools which focus on storytelling. One of it is Storytelling Schools [12]. The basic idea is that children learn to tell stories from memory by listening to them and subsequently retelling them. This strengthens their ability to store language, develop new ideas and enlarge their imagination. Supporting these skills will have a good effect in their future work and life. Each year the students learn a repertoire of stories, connected to their topic and literacy targets. Until the end of year 6, the students learn more than 40 stories. These

stories are then linked into the school curriculum to generate ideas for topic learning and literacy. The success of the project proves that learning with stories can be enjoyable and effective for teachers and students. Starting with oral traditional stories, teachers can apply the storytelling techniques to all subjects like biography, history or geography. The content of these stories is the basis for further explorations of the topic. The teachers are very positive about this method, which is a quick, efficient and enjoyable way to increase the skills of the students. A study of the University of Winchester [13] showed that Storytelling Schools raised standards in writing in an area of social deprivation. Furthermore, children responded positively to their experience with Storytelling Schools and most of them enjoyed it. To provide an all-round education, they develop skills and confidence in speaking and performing.

Story Maker [14], which is an educational game, focuses on storytelling to support literacy. The tool is built on a narrative structure where a hero passes through twelve distinct events. Basically, the structure of a narrative is composed by chapters. These chapters are initially structured by the teacher. Furthermore, the teacher predefines the main topics the students should write about in their stories. The teacher uploads a text as a starting point for the storytelling process, where Story Maker extracts a list of relevant terms. With these terms, relevant pictures are collected from the internet. These pictures can be later used from the students to structure their story. The teacher can pick the most fitting pictures and the tool creates a database with them for the students. When students create their story, they can use one or all pictures out of the database. The main goal for using the pictures, is to inspire the students in their writing and guide them through the creation. The narratives created by the students can be evaluated by the teacher or by other students. Students can post comments and rate each other's story to get feedback and ideas for improvement.

With Lil'Stories, children can create a story and then share it [15]. For creating it, they use storyboards, which visualize a sequence of a narrative through arranged sketches. They can be filled out individually or in groups and the story elements or inputs are put down on paper through drawing and writing. Creating these storyboards helps students to structure their narratives and organize their thinking [15]. When the stories are ready, children share them in a classroom or at home. They have to articulate and communicate their ideas, which practices public speaking, getting feedback and responding it. Based on the storyboard, children can turn them into written narratives

or develop them into plays or puppet shows. The goal of Lil'Stories is to reach different types of learners through a fun and engaging way. Furthermore, it helps to teach story elements and the structure. Covered content in class can be used to inspire plots of stories or characters. Students can also create new stories around specific topics like historical narratives.

The game platform MyGame-4u is a project based on the literature platform eZoomBook for the promotion of public domain English-language literature [16]. They added game mechanics which allow users to create their own learning games and play the ones from other contributors. Both, teachers and students are involved in the process. The teacher creates the game mechanics in form of question templates. The templates are multiple-choice questions which cover specific content. The student then creates games which are related to a book or a specific book chapter they are studying. The students can play the created games of the classmates and answer the questions about the actual book or chapters. They can achieve scores and see their given answers for each question. MyGame-4u is a simple literature-related game, which supports reading activity while still providing fun. Through sharing and publishing the different games inside the class, it is a good tool to motivate students and improve their reading skills.

Areas of research like brain-based learning or educational neuroscience try to improve education using insights about the brain physiology. This includes considering how the brain is acting and reacting in different learning phases. To create “brainfriendly” learning there are some principles which should be recommended. Learning new things is affected by previous knowledge and experience. Furthermore, the brain has a limited working memory, where information gained through frontal instructions, are least saved [17]. To save information in the long-term memory, repeating is essential [17]. Each brain is unique and different, relating to the way it learns the best. An example for brain friendly learning methods is game-based learning [18]. For most of children, gaming is an exciting, funny and voluntary amusement [19]. Digital games have the potential that the players show a high commitment and enjoy spending time on them. There are plenty of educational games, which focus on motivating students to learn something.

Educaplay [20] is a website where different educational games are available. Teacher can generate those games and create classes. They can send the games to classes and

get feedback about the performance of the students. There are different game types available like crossword, dictation or matching mosaic game. The teacher can embed learning content by him or herself in various games or use the pre-built games. The popularity of embedding games into classes is shown by the high number of users of Educaplay. In October 2017, the platform had 1.5 million users. Currently the platform is available in English, Spanish and French. Another tool which works like Educaplay is LearningApps [21]. Teachers can generate games and tasks with the help of templates. They can create classes and administrate them. The disadvantage is that it is not possible to get feedback about the completed tasks or which students played the games. The cost-free tool is available in five different language.

Quia [22] is short term for “Quintessential Instructional Archive” and offers different templates for creating online activities like word search, battleship or cloze exercises. The teacher can grade the students with computer assistance and receives detailed feedback about each student’s performance. The generated games or quizzes can be shared with the whole community. The platform has about 3 million created games by teachers all around the world.

The presented games and tools which focus on storytelling or creating individual educational games, are just a cutout of existing ones. In the last view years, the amount of games and tools for education got bigger and bigger. Each of them has its own approach to create diversified teaching.

3 Fundamentals of Gamification and Learning

To understand the theory behind Story Templates we need to define basic terminology and concepts. Given that, Story Templates is an e-learning platform, this term needs to be explained and discussed. Furthermore, gamification is a major factor to make serious games playable and entertaining. This chapter explains what serious games are and why gamification is required to motivate students to play a game again.

Story Templates uses stories as a core motivational factor. While providing the stories on new digital media, the advantages and limitations of learning on new media are discussed. Furthermore, serious storytelling is explained and why stories are a motivational factor.

E-Learning

There are various definitions for e-learning used throughout the literature. Most of the time it is defined as a form of learning where digital information technology is used [23]. With e-learning, students use the internet as a source of information. But with the web, students are now able to create their own contents and upload them. This creates new possibilities for e-learning.

Using new media and the internet changed our society and the digital progress in classrooms. E-learning offers a way to encourage students to learn self-directed and self-dependent. According to Schmied [24], e-learning especially supports individual learning and self-organization of students. But self-organized learning is a challenge, because students first have to adopt different skills, like previous knowledge or interest into the topic [25]. Reinmann [25] points out that the will for self-organization must be assured.

Prensky [4] emphasises that today's students are no longer the people our educational system was designed to teach. That's why it is necessary to extend the educational system with e-learning. To integrate e-learning successful into education, the use should be reflected and carried out. Furthermore, Prensky [4] states that especially the thinking patterns changed fundamentally. He calls today's students "Digital Natives", which are "native speakers" of the digital language and were born into the digital world. On the other hand, he defines "Digital Immigrants", which came in contact

with the digital world later in their lives. Digital Immigrants have to learn the new language of the digital world. This leads to one of the biggest problems in education. The teachers are struggling to teach a population which speaks a new unknown language. The learning patterns of both groups differ clearly. Prensky [4] emphasises that Digital Natives like to learn parallel, multi-task and receive their information very fast. On the contrary, Digital Immigrants are used to teach slowly, step-by-step and one thing at a time. They often think that the same methods they grew up with, work for the new generation of students now. But due to the digital movement, this is no longer valid. Prensky [4] thinks, that teachers need to learn to communicate in the language and style of their students. They do not have to change good thinking skills or what is important. The teachers need to get rid of the “traditional” curriculum and adjust to the digital development.

But nowadays, the integration of e-learning slowly takes place in classrooms. There are different ways to integrate new media into school. Würffel [26] defines four didactic scenarios for e-learning at schools. The first scenario describes face-to-face teaching, supplemented by using internet. This scenario is widespread and reality in most of the classrooms. Classrooms do not have to be equipped with computers, it's enough when students have access to computers outside of school. They can search for information on the internet, for homework or presentations. At the second scenario, the online components are more weighted. Each student needs to have a computer or a mobile phone and the access can be available outside school. The scenario can be realized by having a learning platform, where students and teacher can communicate. Homework can be published and collected, which should be commented and rated by the teacher. To strengthen the solidarity of the class, a classroom chat would be very appropriate. The third scenario is characterized through strong geared online components and face-to-face teaching. In the fourth scenario, face-to-face teaching no longer exists. Teaching and learning is realized virtual. The implementation of the third and fourth scenario is very complex. Now, education is not imaginable without face-to-face teaching or even teaching only virtual.

Given that, e-learning brings computers and new media to classrooms, they should not replace essential thinking processes. According to Blumrich [27], the computer should support them in concrete and specific tasks. The normality and implicitness of growing up with technology leads to integrating it into everyday life at school. The so-called

“Blended Learning” is the integration of e-learning into commonplace classroom teaching [28]. “Blended Learning” connects benefits of conventional teaching methods with new methods like e-learning. It refers to a mix of teaching forms and to a mix of different pedagogic strategies.

All in all, e-learning is an important component of modern pedagogics. Education should be designed to give students space to learn individually and cooperative. The integration of e-learning can be very motivational and helpful, which calls for teacher to stay up to date and improve their technological skills [29].

Gamification

Everybody likes to play games. We play them to create enjoyable experiences for us and others, independent of our location. Games can be played everywhere, on vacation, at work or just while relaxing. If elements from (digital) games are applied to contexts or activities which are no games, it is called gamification. Boring or monotonous activities can be enhanced by integrating gaming mechanisms.

“The fun theory” thinks that something as simple as fun is the easiest way to change people’s behavior for the better [30], [31]. They created for example the world’s deepest garbage bin. It looks like a normal garbage bin, but if you throw garbage into it, a sensor is activated which simulates the sound that the garbage is falling down hundreds of meters. Almost twice as much garbage as usual was thrown away into this garbage bin. They also altered steps of an underground station in Stockholm to huge working piano keys. After short time 66% more people used the stairs instead of the moving stairway [31]. Projects like these show that gamification motivates people to make boring activities fun again. Gamification is used in many fields like healthcare, transportation, government or education. Many companies use gamification to deepen the relationships to their customers. For example, Nissan drivers can collect points for driving ecologically and can compete with their Facebook friends.

According to Robson et al. [32], gamification is the application of lessons from the gaming domain to change behaviors in non-game situations. Furthermore, they determine three important gamification principles: mechanics, dynamics and emotions [32].

The mechanics define the goals and rules of the game, the context and the boundaries of the situation to be gamified. Mechanics remain constant and are fixed before the

gaming experience starts. That means they never change and each player gets the same game mechanics. For example, in chess the game mechanics are the number of pieces, how they move or how the player can win. The mechanics are the most important aspects of gamification. They define how to win or lose, how the players interact and where the experience takes place. Generally, it forms the structure of the whole gamified experience. But, mechanics are not enough to motivate players. The other key dimensions, emotions and dynamics, animate the experience to get the desired motivation of the player. Those three dimensions stand in an independent relationship with each other. Dynamics are the types of player behavior which occur during the gaming experience. The dynamics are produced by how the player follows the game mechanics and describe in-game behaviors. While the mechanics in the game Poker are shuffling or betting, the game dynamics could be luffing, cheating or bragging. Game dynamics are difficult to predict and can lead to positive or negative unintentional behavior. The goal is to anticipate the dynamics that can emerge and adapt the mechanics appropriately. The last dimension are the emotions. Gamification emotions are the reactions and the mental affective states which occur during a gamified experience. The emotions are individual, depending on the player. They are a product of how the player follows the game mechanics and which dynamics he generates. The emotions should be mostly fun-oriented for the enjoyment of the player. Fun motivates players to continue playing and is an important goal for gamification. Enjoyment and fun can be achieved through positive emotions like amusement, personal triumph or surprise. Players often feel a mix of emotions while playing, which includes also negative feelings when losing or not achieving a reward. The three gamification principles mechanics, dynamics and emotions strongly relate to one another, where small changes in one principle can impact the other two and create a different player experience. Understanding the principles and their relationship is key for successfully gamify an experience [32].

The basic idea of gamification can be mapped on education, whereby learning can be designed attractive and exciting for children [31]. According to Ebner [23] and Meier [33] different forms of learning are developed by using games in education. Active learning is a basic element of games, because students get immediate feedback on their actions and can react fast on them. Students can collect experiences and try different strategies, which supports constructive learning. Self-directed learning offers students

the possibility to determine the game time and game direction by themselves. Furthermore, they can identify themselves with the characters and roles inside the game, which is known as emotional learning. Through changing characters or roles students learn to see problems or tasks from another perspective.

Gamification offers a way to motivate students to learn and simultaneously provides entertainment. Boring activities can be improved and designed more interesting.

Serious Games

“A serious game is a game in which education (in its various forms) is the primary goal, rather than entertainment” [34].

Since our childhood we know games. We enjoy the competition, rules and fun within games. They create an imaginary world that absorbs the player's full attention. The most important motivation for playing a game is fun. But fun is not an ingredient in a game, it is a result. According to Koster [35], fun is a side effect of learning something new. Fun is a positive feedback mechanism which motivates us to repeat the activity over and over. But a game can only be fun if the player enjoys playing it. Given that, a player chooses to play a game, there is an implication of enjoyment. Whether based on a past experience or anticipation. If a player had an unpleasant past experience with the game, he won't play it again. So, fun is the main factor to experience a new game or stick to a game.

There is still a debate about the question if serious games need to be fun. Michael [34] made a survey with game developers, educators, and researchers about this debated question. Over 80% think that the element of fun is important or very important. This shows, that fun is a major factor for playing a serious game. Making a serious game fun is the main challenge for game developers. Given that, every person interprets a fun simulation differently, this task is not easy. Although serious games do not focus on entertainment, it does not mean that they are not entertaining. The main point of serious games is to get players to learn something and at best while having fun.

Although the acceptance of games as educational tool is growing, there are sceptics who think games can't teach anything useful and hold on to more traditional methods. But like any new teaching tool it must undergo this scrutiny. In the past, the use of computers was discussed intensively. Now it is common to use computers in classrooms and serious games will also prove their value like computers.

In the 1980s personal computers like Apple Macintosh or the Apple 2 series made the move from home to the classroom. By launching the “Classrooms of Tomorrow Program”, Apple Computer really wanted to establish computers in classrooms. With the development of a whole variety of different learning tools, personal computers found their way into modern classrooms. Through modernization of computers, educational software boomed in the 1990s. There was a big selection of different games and tools for using at home or in school. Developers started to make educational tools entertaining to motivate students to use them at home or just for fun. This led to a big growth of educational games and software. Furthermore, there has been more acceptance of educational games by parents than by teachers. As education professionals, teachers tend to be more skeptical and still need to be convinced about the efficiency of serious games in classrooms.

Although there are skeptics, it seems inevitable that future games will establish in classrooms. The survey from Michael [34] we mentioned before showed that 95% of respondents stated that serious games will become a standard part of education curriculum. Several respondents said that serious games may become a standard part of education and training, but it won’t happen soon. It will take a while, because the public’s acceptance is too low now. Serious games should not replace teachers or professors, they should be a part of the new educational toolbox [34].

Learning with new Media

Nowadays children have easy access to interactive technology like tablets or phones. An American study [7] showed that 57% of teens who are online regularly create their own content for the internet in the age of 12 to 17, which are about 12 million teens. This shows, that children enjoy spending time on their devices. Beside using them for private fun, children can use phones or tablets for education. They can learn on them at home or at school. However, traditional learning methods like face-to-face teaching are practiced the most. There is also little research on the efficacy of children’s learning from interactive media in comparison to traditional learning approaches.

Kwok et al. [36] made a study which addresses this research question. They formed two groups of children in the age of 4 to 8. Both groups learned new information about animals. One group was taught by an adult female researcher face-to-face. The other group got an analogous instruction from an interactive device (iPad) presented as a

game. Within the application a pre-recorded audio file of an adult female voice, represented by a cartoon character, was used to transfer the information. The results showed that the children performed equally well in both groups. All children in the sample recalled the presented information significantly by chance. It was not relevant if they learned the facts from face-to-face teaching or from interactive media. These results show that the compared methods can be similarly effective learning methods for children in this age. The testing was realized directly after the learning phase, so it is an open question for future research if there is a difference in memorizing information over longer times. The study of Kwok et al. [36] showed that the use of modern interactive media can be as effective as traditional learning techniques, at least under certain conditions.

Besides using tablets in education, mobile phones can be used too. With a percentage of 94%, almost every teenager in Germany owns a phone in the age of 16 to 18 [37]. Furthermore, a quarter of all six-year-old children own a smartphone and the percentage is increasing rapidly the older the children get. Given that, so much children own a smartphone, it offers a great possibility to integrate them into classrooms. If teaching or learning scenarios are supported by the help of mobile media, it is called mobile learning. Mobile media can be a smartphone, mobile gaming console, netbook, handheld, or tablet PCs. According to Döring and Kleeber [38] there are different scenarios using mobile media in education. The easiest scenario is that classic learning material is accessed with the help of mobile media. Furthermore, there is the possibility to use mobile practicing programs for different subjects. To develop media literacy, mobile media should be used as a learning tool for cooperative and activity-oriented learning.

If knowledge should be saved in the long-term memory, it must be repeated in form of tasks [39]. This could be reading the content a bunch of times or watching/hearing the content. Mobile learning supports this kind of learning through E-Books, written notes or recorded teaching. Learning through repetition is very popular on mobile phones. The content can be partitioned into small learning unities, known as microlearning [39]. Furthermore, mobile learning is time- and location-independent and the learning motivation of students can be raised [39]. Using popular technologies is more fun than using conventional books or file cards. But the vision that children or teenager learn for school on their phone while waiting at the bus station is unrealistic

at this moment. Still, it's a fact that there must be a development in education to teach media literacy and to expand teaching with modern media. To accomplish that, it's important that teachers learn to deal with digital technology. They cannot communicate media literacy if they did not gain it by themselves. It is necessary that teachers can interact seriously with digital media and its didactics [40]. Furthermore, it is important that mobile applications for children are developed and designed to harmonize with their technological skills and learning capabilities [41].

Within the fast evolution of technology, a lot of educators are enthusiastic about the use of mobile devices for teaching and learning purposes. Children can surf websites, read books, write texts and a lot more things using their fingers. Digital media offers a new way to motivate children, which can help to enlarge the actual teaching methods.

Digital Reading

Since the emerge of the personal computer the way we read and encounter children's literature strongly changed [42]. Print-based texts in classrooms are challenged through e-readers or interactive digital storybooks. Children nowadays can read their literature on Kindles, phones or computer screens. The electronic devices allow the reader to dynamically change the size of the font, share reviews, leave comments or get recommendations from booksellers after finishing the ones they are reading.

Researchers call the younger children "Digital Natives" or "Gen Z" [16]. In the last decade researchers tried to explore the consequences of the wide availability of the internet on people into this digital world. This generation changed in the way they learn and especially the way they read. Gen Z readers read different media, share and analyze the content with others. Their strength is their creativity. They produce digital contents of all sorts, like fan fiction, remixes or countless YouTube videos. This generation is constant online and multitasks a lot. Through the constant stream of stimuli from the available media like the smartphone, it is a real challenge for them to learn and focus on only one thing [16]. New technologies supporting Gen Z can be powerful, but the brains can become more accustomed to constantly switching tasks than adult brains. With this, it gets hard for the reader to keep the attention to the text.

Reading digitally based text requires decoding the written language and learn to navigate new text structures like hypertext or nonlinear narratives. Digital devices, like Kindle or iPad, offer access to digitally based dictionaries which support

expanding the vocabulary and the comprehension of the text. In our modern world readers can share and archive their reading. They can create reading histories online or collect books for future readings inside a digital bookshelf. Furthermore, they can share what they have read or are currently reading with others all around the world. Modern reading platforms offer the possibility to highlight sections of texts and share those with other readers. With this, the reader can see what other readers have found important in the book or text. In the past, reading was mainly an individual experience, but it has become a more social event through the evolution of digital resources [42].

Not only adults like to read e-books, children do so too. With this, it is important that educators understand how to effectively integrate this technology into the classroom [43]. Meanwhile there are numerous new literacies in form of digital texts. Teachers are challenged to create reading instruction which fits the constantly emerging and evolving technologies. Although some e-books contain multimodal features like a hyperlinked table of contents, most digital reading devices are linear (e.g. Kindle or Nooks).

With e-books, reading can be realized more dynamic than reading printed books. An e-book can contain several layers and readers may explore the content more extensively. They can act on the content and furthermore create a dialogue with the text [44]. On the other hand, too much hypertexts or links can influence the readers concentration, or he may be lost in the crowd of nodes and links. This can lead to abandoning the text and unhappiness.

According to Hurrelmann [45], there are two dimensions relating to the need of the reader. The “dimension of the motivation” deals with the need of the reader to understand the text and to have the appropriate endurance. Another important role plays the “dimension of emotions”, where the reading should affect the emotional world of the reader. Both, the motivation and the emotions are important for binding the reader to the text. There are four different forms of motivation. First, it differs in the motive. On the one side there is intrinsic motivation, which is driven by the self-interest to the text of the reader. On the other side, there is extrinsic motivation, which is other-directed. The reading happens by order of someone or by possible rewards in prospective. For example, in school, the reward could be a good grade or praise and recognition. It is very important that extrinsic motivation is not voluntary. The reader is not reading because he likes to, he is reading because he has to. The other two

subdivisions refer to the factor of time. If the reader is at this moment interested in the text, it is called the actual reading motivation [46]. If the reading happens out of habit, the motivation is called habitual.

Independent of the motivation of the reader, digital devices offer new ways to read and interact with stories or texts. As we argued earlier, providing texts on screen can help to raise the motivation of students and show them how to interact with them in the right way.

Serious Storytelling

Stories attend our whole lives. Starting as children, where our parents read books to us. Followed by school where stories are a part of the education. As adults we get in touch with stories through the news, books or digital media. Stories are told to entertain, to transfer knowledge between generations or to warn others of dangers. Historically storytelling has two main functions. Stories should entertain and teach people how to become better human beings [47]. We share our experiences through stories and try to make sense of it. Furthermore, we communicate these stories to others to pass our experiences to them. Listening to these stories helps us to understand ourselves as we identify with the experiences.

Through digitalization, the way stories can be told is multifaceted. Stories can be used just for entertainment, but also for serious and non-entertainment contexts. Lugmayr et al. [48] define serious storytelling as “storytelling with a purpose beyond entertainment”. There are many genres which can contain serious storytelling, for example e-learning, psychology, serious games or persuasive marketing.

The most important component of a story is emotion. To trigger emotional responses, the artist creates a subset of reality from a specific perspective. The main feature of a story can be stimulating human cognition and trigger emotion. A story is usually told by an outsider who is responsible for explanations and comments upon the flow of events inside the plot. A story is pushed forward by a narrative flow of events which take place in time and space. These events contain actions related to characters which evolve through the story. A well-told story consists of the interplay between characters and the journey of the hero through several events. Furthermore, it should allow the listener or reader to draw his own conclusions.

Reading a book creates a fictive world in the reader's mind, based on the author's words. The book represents the medium which creates this imagined world. Serious storytelling embeds subsets of a meaningful arrangement of knowledge into a story. Through past experience, readers can create new knowledge by interpreting the meaning of the stories. Readers can gain new insights, skills or know-how in real-life situations. In the case of education and learning, the main interest of serious storytelling is the transfer of knowledge. The goal of the learner is to create structured information as part of a classroom experience. In education, storytelling has already been a part in the past. But through technical development, enhanced educational technology gains importance. To create exciting and more engaging learning experiences, digital storytelling can be a powerful tool [49]. Stories can be used to make the content more interesting and captivating. The readers can be involved in the learning process instead of being a passive information receiver [47].

New technologies offer educators the opportunity to enhance the standard of education. Smeda et al. [49] state that the student engagement, achievement and motivation are enhanced through integration of such technologies. Although the impact of these technologies has been mostly positive in the educational aspects, there is also the challenge to enhance student engagement to provide better educational outcomes. Therefore, it is important to use innovative pedagogical models, like digital storytelling [49].

The main purpose of serious stories is knowledge and wisdom creation for a serious context matter [48]. Although serious stories can be entertaining, the major goals are creating a system where humans can gain knowledge, interact meaningful and use it purposeful.

4 Tools for implementation

As we already mentioned, Story Templates is an e-learning platform which consists of a website and a mobile application. The website was created with HTML, CSS, JavaScript and PHP. With the help of the framework Apache Cordova [50], which also uses the common web technologies, the mobile application was created. Furthermore, there is a MySQL database which holds all important information for both parts of the tool.

The following chapter describes all frameworks and tools which were used to develop Story Templates.

Apache Cordova

Apache Cordova [50] is an open source project that uses common web technologies to create native mobile applications. It uses technologies like HTML (HyperText Markup Language) [51], CSS (Cascading Style Sheets) [52] and JavaScript [53]. The project contains a set of JavaScript API's, which provide access to the features of a mobile device.

In developing a mobile application there are three approaches: mobile web applications, hybrid mobile applications or native mobile applications [54]. Mobile web applications can be accessed only through the web browser. They are responsive, which means that they adapt their view to any screen size to be displayed correctly. They are created like a website with HTML and CSS. But, the access to the features of the device is very limited. Another approach is, creating a native mobile application. These applications are programmed using the mobile platform programming language. For example, Java for Android, Objective-C for iOS or .NET for Windows Phones. If an application should run on different platforms, the developer needs to reimplement its logic for each platform and programming language. With each programming language or platform, different types of problems will appear. The last approach is creating hybrid applications, which has the advantage to use the same code base for different platforms of the application [54]. They are developed using common web technologies like HTML, CSS and JavaScript. The application code has to be written once and then it can be run anywhere, also on the computer. Although each platform needs some changes, they are mostly minimal. On the one hand, hybrid applications

can be created much faster than native applications. But, on the other hand, native applications are a little bit faster than hybrid applications [54]. Because hybrid applications are platform independent, this approach was used to develop the mobile application of Story Templates. For building hybrid mobile applications Apache Cordova is one of the most popular frameworks [54]. Given that, Apache Cordova is easy to install and use, the mobile application of Story Templates was created with this framework. Especially the platform independency is a big advantage for this project. Because a lot of schools are not equipped with tablets or mobile devices, it was necessary to create a tool which can also be run on the computer. We solved this problem by working with Apache Cordova.

HTML

The Hypertext Markup Language is the core language of the World Wide Web [51]. Furthermore, it is the standard markup language for establishing websites. Basically, it describes the structure of the page in a machine-readable language (markup), where the elements of HTML are the building blocks of the web page. The web browser renders the HTML document from a web server and displays the web page. With the help of tags inside the elements, the browser knows how to display the page. The first version of HTML was released in 1991. Since then there have been many versions of it.

Story Templates was created with the newest version HTML5, launched in 2014 [51]. It provides some new elements for forms, graphics and multimedia. In particular we made use of the calendar and date form elements. With the combination of HTML, JavaScript and CSS, powerful websites can be created. The next two chapters describe the other two cornerstone technologies of the World Wide Web.

CSS

Besides HTML, Cascading Style Sheets [52] are part of the creation of a website. CSS is a language which is responsible for describing the style of a HTML document. It describes how the elements should be displayed and is able to control the layout of multiple web pages at once. With this, the description of the content and the styling of it can be separated. The CSS files can easily be used again in other contexts. To change the look of a website, the external CSS file just has to be replaced by a new one. This has the big advantage that the HTML files are not affected by design changes. Sticking

together the structure and the styling inside the HTML files, makes it very difficult to change the look of a web page. So, the development of CSS was a big relief for web developers.

For developing Story Templates, CSS was used in external files. Furthermore, the open-source Framework Bootstrap [55] was used. It includes HTML, CSS and JavaScript based design templates for forms, buttons, navigation etc. The framework focuses on front-end development and offers a responsive grid system. With the grid system the developer can subdivide the page into requested grids which are fully responsive. This has the great advantage that the content will be displayed correctly, independent of the screen size. Bootstrap was used for the website of the teacher. The framework was a great help for designing the navigation and basic layout. Especially the grid system offered an easy way to place the buttons and form elements in the right position, without the need to consider different screen sizes.

JavaScript

The last big cornerstone for building a powerful website is JavaScript [53]. JavaScript is responsible for the behavior of web pages, and in particular each interaction with the website can be controlled. For example, it can be defined what happens if a user clicks on a specific button. The programming language exists since 1996 and was regularly improved since then.

In Story Templates we used the JavaScript library jQuery [56]. It is fast, small, easy to learn and feature-rich. JQuery simplifies the programming of JavaScript and makes the development faster. The API is easy-to-use and works across multiple browsers. Event handlings or AJAX (Asynchronous JavaScript and Xml) [57] requests can be programmed fast and efficient. AJAX allows web applications to update a page without reloading it. It requests and receives data from the server after the page has loaded. Furthermore, sending the data to the server is running in the background. This is a great concept which allows web developers to make user friendly web applications.

JQuery was not only used on the website of the teachers, but also in the mobile application. With jQuery Mobile [58], the library works without difficulties and fast on mobile devices. The big advantage is that it is touch-optimized. On tablets or smartphones, the events are handled a little bit different than on a usual computer.

There are no real mouse events, instead there are gestures like swiping. The framework can handle those events and makes it easier for the developer to program the functions needed for the events. Furthermore, it is compatible with almost all operation systems and offers CSS files which are adapted to mobile devices. Additionally, we used the small JavaScript library Bootbox [59]. It offered well designed dialog boxes which were easy to use.

The whole framework of jQuery, including the mobile version, offered a lot of advantages for using it for our project. It is easy to include and the syntax is not hard to understand. Especially the CSS file for the mobile version offers great designed elements which are adjusted to all sorts of mobile devices or tablets.

MySQL

For saving all the data created by the students and teachers in Story Templates, a MySQL [60] database was used. MySQL is an open-source database system which manages databases. It is very stable and popular for smaller systems. Given that, the database of Story Templates is not complex or too big, MySQL was a fitting solution. Furthermore, MySQL Workbench [61] was used for the visualization and modelling of the data. The tool offers easy ways to edit or show the data. It gives a great overview about the tables and the structure of the database. While coding database requests it helped finding mistakes or errors in the statements.

PHP

For connecting the database with the web page and the mobile application, PHP (Hypertext Preprocessor) was used. It is a very popular open-source scripting language which is especially suited for web development [62]. PHP can be easily embedded into HTML or used in external files. The code is executed on the server and the output is then sent to the client, which has also the benefit that users can't see the underlying code.

In Story Templates, PHP is responsible for getting, editing or deleting data from the MySQL database. Via AJAX requests with jQuery or jQuery Mobile, a connection is built to the database with PHP. The PHP files include and execute different MySQL statements. Furthermore, the redelivered data can be edited and modified for desire inside the PHP file. PHP offered a fast way to access the data from the database. The scripting language was easy to learn and still very powerful.

Highcharts

On the website for the teachers, Story Templates offers statistics about the results and answers of the students. For the visualization of the pie chart, which shows an overview of the whole class, Highcharts [63] was used. It is an open-source framework which provides different kinds of charts for web pages. The big advantage is that the charts are interactive and well designed. That makes it easy to produce a good-looking and animated pie chart. Another big advantage for using Highcharts is the fast and simple integration and the easy filling of the data.

5 Story Templates

5.1 Introduction to Story Templates

The main idea of Story Templates is to combine tasks of different school subjects with exciting stories. The goal is to raise the motivation of the students with the help of stories and the usage of digital devices. Furthermore, the tool helps the teacher to repeat learning content and simultaneously strengthen the reading competence of the students.

The tool provides different categories of stories, e.g. fairy tales or adventurous stories. Learning content is integrated into these stories. Each story has a defined number of breaks where each break has to be filled with a task (template). The topics of the tasks can be wide spread and can include every school subject, for example mathematics. At the end, the students get a story of a specific category with tasks of a specific subject on their smartphone, tablet or computer. The most important idea is to place the breaks meaningfully and not randomly inside the stories. The student should have the feeling to be a part of the story, not only being a reader.

The e-learning tool Story Templates consists of a website for teachers and a mobile application for students. The website offers the teacher a simple way to generate all stories with the integrated tasks. The teacher can create new tasks or administrate old ones. Furthermore, he has his own student administration and can get statistics about the results of his students.

Basically, Story Templates works like this: The teacher creates a story with the desired tasks inside. This can be done by himself or a story generator where the teacher only has to define the desired characteristics of the story and the tasks. After that, the story is sent to the class and the students get the new story on their digital device. They can start reading and solving tasks immediately. The teacher can view the statistics about his students and check their progress.

The following chapter describes and shows both parts of Story Templates in detail, the website and the mobile application.

5.2 The Teacher Website

To provide an easy-to-use website, the design and navigation is held simple. The website is subdivided into different parts. The parts and subparts can be accessed through a simple navigation menu. Basically, there are four main parts: stories, templates, statistics and the student administration. Under the item stories, there are several possibilities to choose. The teacher can upload his own story and send it to the class. Furthermore, a story can be automatically generated, sent or also deleted. The template item offers the teacher a form to create the tasks for the students. To view the results of the students, the statistics can be retrieved over a main item. Furthermore, the teacher can add and edit his students inside the student administration.

The following chapter explains all possible actions on the website in detail.

Login and register

If Story Templates is accessed by a teacher, he first has to login with the help of a little form which requires username and password (Figure 1). If a user wants to create a new account, he has to click on the register button and a form will appear.

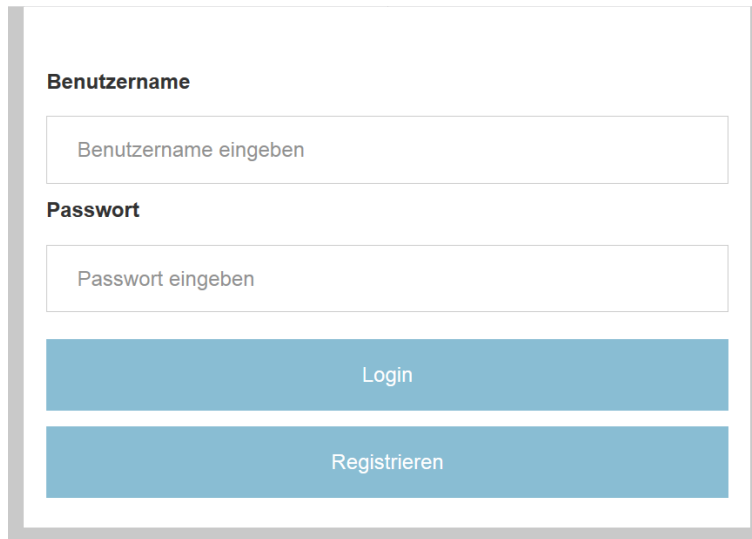
The image shows a login form for a teacher. It is enclosed in a light gray border. At the top, the label "Benutzername" is in bold. Below it is a text input field with the placeholder text "Benutzername eingeben". Underneath that, the label "Passwort" is in bold. Below it is another text input field with the placeholder text "Passwort eingeben". At the bottom of the form, there are two blue buttons. The top button is labeled "Login" and the bottom button is labeled "Registrieren".

Figure 1: Login form for the teacher.

The register form (Figure 2) is asking for some information about the teacher. At first, a unique username, the first name und the surname has to be filled in. Optionally the teacher can specify the school name. After the personal information, the teacher needs to define a desired password and repeat it once. By clicking the registration button on

the bottom of the form, the teacher is registered and can start immediately using the platform. The form is held short and simple to guarantee a fast registration.



The registration form is divided into two main sections: 'Persönliche Daten' (Personal Data) and 'Passwort definieren' (Define Password). The 'Persönliche Daten' section contains four input fields: 'Benutzername *' (Username), 'Vorname *' (First Name), 'Nachname *' (Last Name), and 'Schule' (School). Each field has a placeholder text indicating where to enter the information. The 'Passwort definieren' section contains two input fields: 'Passwort *' (Password) and 'Passwort wiederholen *' (Repeat Password). Below these sections is a large blue button labeled 'Registrieren' (Register).

Figure 2: Registration form for a new user.

Templates

As already mentioned, the templates are the tasks which the students have to solve while reading a story. Now, there are two kinds of templates available on Story Templates. The first ones are multiple-choice questions, which consist of a question with four answers. Only one answer is right and must be marked by the teacher while creating the template. The other kind of template is the free answer question, which only consists of a question. The student gets the question and an empty text field where he can write free text answers.

On the creation page of the templates the teacher can choose between creating a new template or editing an old one. If he wants to create a new one, he can select the type of the desired template and the proper form will be loaded. Figure 3 shows the empty form, which is loaded when the teacher creates a new multiple-choice template. While creating a new template, the teacher needs to assign a unique name for it. Furthermore, he needs to fill in a question and the four possible answers. It is important that the right answer is marked, so that the statistics can be evaluated correctly. The last steps are to fill out the school subject and the proper subcategory. The subject could be for example mathematics and the subcategory addition.

The form for creating a free template looks almost the same like Figure 3. Everything stays the same, except the answers. They are not available for this kind of template and are not shown in the form.

The form is titled 'Name:' and contains a text input field with the placeholder 'Namen für Vorlage eingeben...'. Below this is a 'Frage:' section with a large text area. The 'Antworten:' section is labeled with a question mark icon and contains four radio buttons, each followed by a text input field. Below the answers is a 'Unterrichtsfach:' dropdown menu with the placeholder '-- Bitte auswählen --'. Below that is a 'Kategorie:' dropdown menu with the placeholder '-- Bitte zuerst Unterrichtsfach wählen --'. At the bottom is a blue button labeled 'Neue Vorlage speichern'.

Figure 3: An empty multiple-choice question form for creating a new template.

If the teacher decides to edit an existing template, he can choose from a dropdown menu with all available templates. The proper form is loaded with the data inside. The teacher can edit it for his desire and save it again. The goal of the web page was to keep the creation and editing very simple.

Create story

The teacher has the possibility to upload his own story. Figure 4 shows the form for inserting a new story. First the teacher has to define a name for the story, for example Cinderella. Furthermore, the author of the story has to be filled in, which is important to avoid copyright issues. The information of the author and a copyright sign is always shown at the end of each story in the mobile application for the students. By viewing this copyright information, there is no trouble while using stories with copyright.

The next step is to select the category of the story, for example adventure or funny. Furthermore, the reading strength needs to be defined. In Story Templates there are five different categories of reading strength which range from very easy to very hard. These partitions should give a rough guideline for picking out stories. There are no specifications how to classify stories in those categories. The teacher has to decide

which reading strength the new story has by his own judgement. As there are different factors like the word count or the difficulty of the language, the reading strength has to be fixed individually.

Figure 4: The form for uploading a new story.

After defining the reading strength, the teacher needs to insert the text of the story. Given that, the story needs to be partitioned into several parts, the form offers nine text boxes. That means that the story can be partitioned into a maximum of nine parts and thereby can hold nine templates. How many breaks a story should have is decided by the teacher. If he likes to have two breaks, which can later be filled up with templates, he fills the first part into the first text box and the second one into the second box. If a textbox is filled with something, it is saved as a part of the story. If it stays empty, the tool does not include this part. The number of breaks is given by the filled in text box parts. At the end the teacher only has to click the save button and the story is uploaded into the system.

Story generator

Besides uploading an own story and sending it later, the teacher can generate a complete story with the templates with the help of the story generator. The story generator offers a fast and easy way to find fitting stories and send them to the class in one step. The teacher defines the characteristics of the templates and the basic story. Then the generator automatically searches for proper stories and templates. The

templates are embedded into the stories and automatically sent to the class. Finally the student gets a choice of different stories, but the templates stay the same.

As always, the first step is to define a name for the generated story. This is the name the students will see on their application in the listings of the available stories. The name should not name the basic story, but the overall learning content which the templates are about. It gives the students an overview of the kinds of templates the stories will contain. In Figure 5 the story generator form is shown. Besides the name, the teacher has to select the genre of the desired stories, for example adventure. Furthermore, he has to define the reading strength and therefore the difficulty of the stories. After defining the characteristics of the stories, the templates have to be determined.

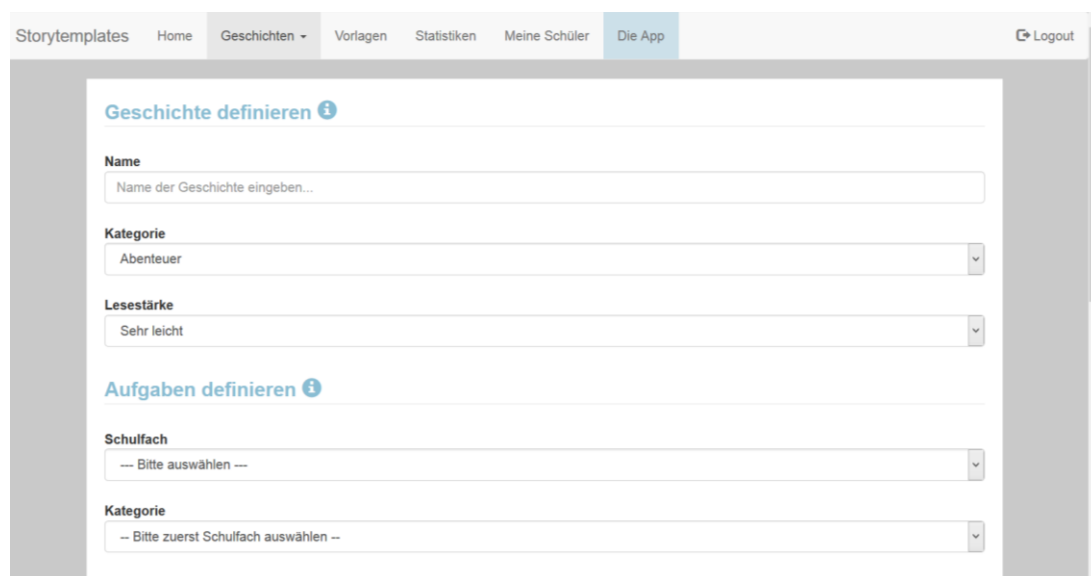
The image shows a web application interface for defining a story. At the top, there is a navigation bar with links: Storytemplates, Home, Geschichten (selected), Vorlagen, Statistiken, Meine Schüler, and Die App. A Logout button is in the top right. The main content area is titled 'Geschichte definieren' with a help icon. It contains two sections: 'Geschichte definieren' and 'Aufgaben definieren'. The first section has three dropdown menus: 'Name' (with placeholder text 'Name der Geschichte eingeben...'), 'Kategorie' (set to 'Abenteuer'), and 'Lesestärke' (set to 'Sehr leicht'). The second section has two dropdown menus: 'Schulfach' (with placeholder text '--- Bitte auswählen ---') and 'Kategorie' (with placeholder text '-- Bitte zuerst Schulfach auswählen --').

Figure 5: First part of the story generator form.

First, the teacher has to select the school subject of the desired templates. This could be for example mathematics or english. The next step is to select the proper subcategory, for example addition or division in mathematics. Furthermore, the number of templates has to be selected. There can only be one or up to nine templates inside a story. Depending on those characteristics, the generator looks for stories with the desired number of breaks in the database.

In Figure 6 the next section of the form is shown, where the desired class and the deadline has to be selected. The deadline determines the date until the story is shown

inside the application of the students. If the teacher clicks into the deadline text field, a calendar will popup, which makes it easy to pick a proper date.

Kategorie
-- Bitte zuerst Schulfach auswählen --

Anzahl
-- Anzahl der Aufgaben auswählen --

Klasse definieren

Klasse
1A

Zu erledigen bis
TT.MM.JJJJ

Lernkontrolle definieren

☒ keine Lernkontrolle ⓘ
☐ allgemeine Statistik ⓘ
☐ einzelne Statistik ⓘ

Geschichte senden

Figure 6: The second part of the story generator form.

The last step is to define the learn control. It defines which statistics should be generated for the actual story. The teacher can choose if he wants no statistic, a general statistic or a unique statistic. The details of the Statistics will be explained in an extra section.

After filling in the whole form, the teacher can generate and send the story by clicking on the last button. The generator searches for proper stories and templates in the database and sends the ready story to the class.

Send story

The platform provides a page where the teacher has the possibility to add the templates by himself to the stories and send it to the class. Furthermore, he can choose if he wants to create a new story or edit an old one. In Figure 7 the two select lists at the beginning are shown, where the teacher can choose between these two possibilities.

After picking the desired story and clicking on the button, the proper form is loaded. If a new story is picked, all fields except the story parts stay empty. The first step is defining a name, which is then shown in the application of the students. After the name, all story parts are shown in uneditable text boxes. The number of text boxes is

automatically adapted to the number of storybreaks in the original story. In Figure 7 you can see that the story only consists of two parts and therefore can hold two templates. If a teacher uploaded a story by himself, this is the number of story parts he filled in.

After each textbox, a select list is shown, which contains all available templates. The teacher needs to select a template after each break of the story. The story parts can be read, but not edited anymore. Furthermore, it is not possible to use a template twice within a story.

Geschichte an Klasse senden

Hier können selbst hochgeladene bzw. existierende Geschichten mit den Vorlagen verbunden werden und an die Klasse gesendet werden. Damit das Kind zwischen Geschichten aussuchen kann, können am Ende noch weitere Geschichten hinzugefügt werden. Bitte wählen Sie ob sie eine neue Geschichte mit Vorlagen erweitern wollen oder ob Sie eine bereits existierende Geschichte bearbeiten und nochmal senden wollen:

Die kleine Raupe Lilli

▼

Neue Geschichte auswählen

Addition

▼

Vorhandene Geschichte bearbeiten

Name für Geschichte(n) i

Namen für die Geschichte(n) eingeben...

Vorlagen hinzufügen i

Teil1

Es war einmal eine kleine Raupe, die hieß Lilli. Jeden Morgen nach einem langen und gemütlichen Frühstück zusammen mit ihren Eltern, ging Lilli ihre Oma Ilse besuchen. Sie wohnt nicht weit weg von dem Haselnussstrauch, wo Lilli zu Hause ist. Heute ist ein besonders ungemütlicher und stürmischer Tag. Schon die ganze Nacht hat es geregnet und auch jetzt ist die Sonne noch nicht zu sehen. Die Wolken hängen ganz tief und ohne Gummistiefel kann man bei diesem Wetter auf

Add10+10 ▼

Teil2

Lilli ist noch gar nicht weit gelaufen, als sie jemanden weinen hört. Sie schaut sich um und tatsächlich hinter einem Blatt sieht Lilli einen Regenwurm, der ganz traurig ist. „Was ist denn mit dir los, lieber Regenwurm?“ fragt Lilli ganz zaghaft. „Ach, nichts!“ seufzt der Regenwurm. „Aber warum bist du dann so traurig?“

Add3+3 ▼

Figure 7: First part of the form for sending a new story.

The next step is to choose the learn control and set the deadline. Furthermore, the teacher needs to select the desired class. To save important information which is used by the story generator, the teacher has to define the school subject and the proper subcategory. As it can be seen in Figure 8, the last step is to add further stories. The teacher has the possibility to add other stories to the basic story. A list on the left side shows all available stories which fit the number of templates. By selecting the desired stories and adding them with a button to the right side, they will be automatically saved inside the story. The added stories are then showed as a selection of stories, besides the original story, in the application of the students. The students will see a list of stories, where they can choose from.

Lernkontrolle auswählen

☒ keine Lernkontrolle ⓘ
☐ allgemeine Statistik ⓘ
☐ einzelne Statistik ⓘ

Schüler

Zu erledigen bis: Klasse:

Kategorie

Unterrichtsfach:

Unterkategorie:

Weitere Geschichten auswählen ⓘ

Figure 8: Second part of the form for sending a new story.

If all fields and select lists are filled in correctly, the story can be sent with the last button on the page. The students will immediately see the new story in their application.

Statistics

The statistics give the teacher the possibility to check the results of his students. Each story has its own statistic. As mentioned above, the teacher has three different choices. If the teacher is not interested in the results, he can define that he wants no statistics about the story. For showing the result, the teacher can choose between a general control or a unique control.

The unique statistic shows the teacher a table with specific information about each student. As you can see in Figure 9 the table lists all students and their answers. If a question was multiple-choice, the answer is checked and marked if it is right or wrong. If the field is colored green, the answer was correct and if it is colored red, the answer was wrong.

If the question is of the type free answer, the given answer is shown in the cell. It is not validated and gets no special coloring. If a student has not given an answer yet to a question, the cell is filled with hyphens. This statistic offers individual insight into the given answers and a way for the teacher to grade each student individually.

Statistiken

Bitte wählen Sie die gewünschte Geschichte. Je nach Wahl der Lernkontrolle (allgemein  oder einzeln ) wird die gespeicherte Art von Statistik angezeigt!

Testing

Geschichte laden

Name	Antwort 1	Antwort 2
Roland Bauer	3	20
Maja Morgenroth	1	20
Burkhard Flaum	3	30
Roswitha Fincke	3	30
Renate Grob	3	20
Johann Maurer	---	---
Katja Burschik	---	---

Figure 9: A unique statistic.

If the teacher is not interested in grading each student individually, he can also choose a general statistic over the class. The general statistic generates a pie chart about the results of all students. In Figure 10 you can see an example of this kind of statistic. The pie chart shows the overall number of right answers in green and the wrong answers in red. Given that the free text answers of the students are not evaluated, they are shown as an extra piece colored blue. Furthermore, the gray area displays the number of not answered questions.

Allgemeine Übersicht zu "Subtraktion"

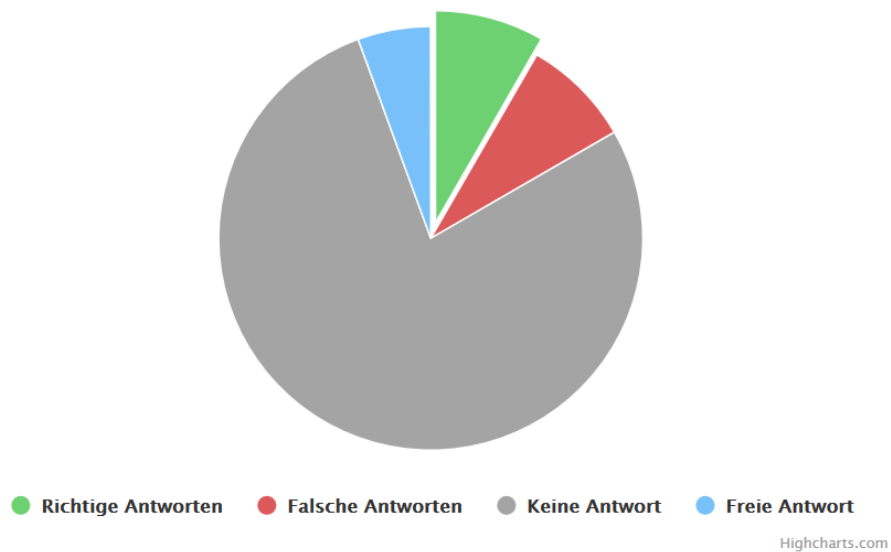


Figure 10: A general statistic, represented by a pie chart.

By hovering over the different parts of the pie chart, the teacher gets the information about the number of answers. The pie parts can be clicked, which changes the visualization and brings out the selected pie part, like the green part in Figure 10. Furthermore, the teacher can download the statistic or print it.

Student administration

Each story can be sent to a whole class. Therefore Story Templates offers a student administration, where the information can be administrated. Each teacher has his own student administration, where all students are shown in a sortable table. Furthermore, the teacher can search for a specific student in the search field. Figure 11 shows an example of a student administration.

+ Hinzufügen

Vorname	Nachname	Klasse	Bearbeiten
Roland	Bauer	1A	✎ ✖
Henry	Bernstein	3A	✎ ✖
Katja	Burschik	1A	✎ ✖
Roswitha	Fincke	1A	✎ ✖
Burkhard	Flaum	1A	✎ ✖
Renate	Grob	1A	✎ ✖
Johann	Maurer	1A	✎ ✖

Zeige 1 bis 10 von 10 Schülern

Figure 11: Student administration.

Each row shows the information of a student. The last column offers icons for editing or deleting a student. If a teacher wants to add a new student, he just has to click the add button in the left corner.

+ Hinzufügen

Vorname	Nachname	Klasse	Bearbeiten
Roland	Bauer	1A	✎ ✖
Henry	Bernstein	3A	✎ ✖
Katja	Burschik	1A	✎ ✖
Roswitha	Fincke	1A	✎ ✖
Burkhard	Flaum	1A	✎ ✖
Renate	Grob	1A	✎ ✖
Johann	Maurer	1A	✎ ✖

Zeige 1 bis 10 von 10 Schülern

SchülerIn hinzufügen

✕

Vorname

Vorname

Nachname

Nachname

Klasse

Klasse

Speichern

Schließen

Figure 12: Adding a student to the database.

Adding a student is easy and the form doesn't need much information. The teacher has to define the first name, the lastname and the class the student attends. The form, shown in Figure 12, is designed simple and easy to understand. If a teacher edits a

student, the form is the same as the one for adding, but with proper prefilled text fields. The whole student administration is clearly arranged to offer fast orientation and simple use.

Implementation

The website for the teachers consists of HTML files, one for each available navigation menu point. The ground structure of each document is the same. After defining and including the needed frameworks and languages, like jQuery or Bootstrap, the navigation menu follows. The navigation menu always stays the same, except the active element, which is highlighted.

To follow the rules of Bootstrap, the content of the page is scripted inside a main container. Inside this container, the files vary from each other. On the pages where a form appears, multiple divs with form elements were used. A div defines a section of the document and can include further HTML elements. Structuring the main components of each page inside divs, eased the styling with CSS. With the help of Bootstrap, the divs can be used as a basic grid for the page. This offered a great way to design and implement the forms user friendly and responsive. The grid basically consists of rows and columns. Each row can consist of 12 columns which can be individually adapted.

```
<div class="row">
  <div class="col-md-4">
    <!-- cell one -->
  </div>

  <div class="col-md-4">
    <!-- cell two -->
  </div>

  <div class="col-md-4">
    <!-- cell three -->
  </div>
</div>
```

Listing 1: Source code of basic grid used in all files.

The example in Listing 1 shows a grid with one row and three columns. The classes of the divs define a medium column with the size of four, where the whole size of the row has to add up to 12. This offers an arrangement of the content independent of the screen size.

In addition to the layout and structure of the content, JavaScript is embedded to get the needed functionalities. For each HTML file, a JavaScript file exists, which contains all functions. With the help of jQuery, the different elements of the HTML file can easily be accessed over an ID. There are event handlers, which can catch for example a click of a user. After catching the events, desired actions can be executed. Furthermore, the connection to the PHP files and therefore to the database, was made with jQuery.

```
$.ajax({
  type: "POST",
  url: "pathToPhpFile.php",
  data: {
    arrayID: textArray,
    id: name
  },
  success: function (data) {
    if (data == true) {
      $('#infoField').text('Already exists!');
    } else {
      alert('Story was successfully added to the database!');
    }
  }
});
```

Listing 2: Example of getting data from the database.

As shown in Listing 2, the sending of data to the server is done by AJAX requests. The data is sent to the PHP file, which catches it by the given ID in the request. Now the data can be processed and a connection to the database can be made inside the PHP files. After processing the needed data, PHP can send back data to jQuery. If the AJAX request is successful, the data can be accessed via jQuery and processed for desire. In the example of Listing 2 the request returned a value which can be true or false. In a subsequent if-statement, different actions can be done depending on the value. On the website each database access is realized after this schema. Only the sent data or received data changes with each request.

AJAX offers the possibility to send and receive JSON data. This allows an easier access and processing of array data. If the format JSON is used, it has to be labeled in the request and the PHP file. Both files need to know which format they should process and send to one another.

A PHP file on Story Templates first needs to connect to the database with proper login details. If data is received from jQuery, it can be caught and saved into variables. Listing 3 shows an example PHP code of retrieving data from the database and send it to jQuery in JSON format. At first the header determines the type of the content, in this case, JSON. The next step is to include the PHP file which builds a connection to the database. The file in Listing 3 catches a value with the ID “story” and saves it to a variable. This value is the ID of the story which should be grabbed from the database.

```
<?php
header('Content-Type: application/json; charset=UTF-8');
include 'connectToDBstoryTemplates.php';
$storyID = $_POST['story'];
$sql = "SELECT * FROM stories WHERE idstories = ".$storyID."";
$result = mysqli_query($con,$sql);
$values = array();
while ($row = mysqli_fetch_assoc($result)) {
    $values[] = $row;
}
echo json_encode($values);
mysqli_close($con);
?>
```

Listing 3: Example of a database request with JSON formatting.

The next step is defining a string which holds the MySQL statement to be executed. In this case, a specific story should be grabbed with the help of the unique ID. After defining the string, the statement is executed with the existing database connection. The returned data from the database is saved and can now be fetched with a while-loop. Inside the while-loop, each value of the returned data is saved into the array for the results, defined before. This Array can now be encoded into the JSON format and sent back to jQuery. At the end of the file, the database connection is closed.

In jQuery, the JSON data can now be used easily. It can be accessed like a normal array and therefore be used inside of loops or for comparisons. The data can be shown on the website in different formats. Besides getting data in JSON format, the data can also be retrieved as normal text data, as in Listing 2.

The layout and design of the website was realized with the help of Bootstrap. Furthermore, there is an external file which holds all individually created additional CSS styles. Bootstrap offers great basic styles, for example for form elements. But the coloring and the fine adjustment was coded in the extra file.

5.3 The Mobile Application for the Student

The mobile application was designed to work on computers, smartphones or any other devices. Schools, which do not own tablets or mobile devices can also use the application on computers, for example in computer rooms. Given that, the application fits to every screen size, the usage does not depend on the device.

The mobile application is constructed to be simple and easy to use. There are not many menus or screens which can lead to confusion. If a student wants to read a story, he just has to login with his login details and will immediately see all stories available. The following chapter explains all possible actions for the student and the gamification integrated into the application.

Login and Registration

If the student opens the mobile application, a login form appears. Figure 13 shows the form where the student has to enter his username and password. The application checks the data immediately by clicking the login button. If the data is not correct, a notification appears which informs the student about the error.

As mentioned in the last chapter, the teacher adds all students. After this, each student can register for the tool and create his username and password. The student can do this by clicking the registration button under the login form in the mobile application. Figure 14 shows the registration form with all the fields the student has to fill in. At first, he needs to define a unique username. Furthermore, he has to type his first name, surname and the class he attends. These three information fields need to be equal to the information the teacher saved. Afterwards the student has to type in a password.

After clicking on the registration button, the student is registered immediately with his login details. He is now able to login and enjoy Story Templates.

StoryTemplates

Login

Benutzername

Passwort

Anmelden

Neues Konto erstellen

Figure 13: Login form for the students.

Neues Konto erst...

Benutzername

Vorname

Nachname

Klasse

Passwort

Registrieren

Figure 14: Registration form for creating an account.

Reading a story

If the student registered and logged in, he first sees a pop-up. It introduces “Filou”, the main character and the story about him. Filou is a cute owl who found a mysterious treasure map on his attic. He and his friends want to find the treasure and ask the student to help them on their adventure. With finishing each story with the right answers, the student will get a piece of the treasure. In Figure 15 you can see the pop-up with Filou and the explanation of the main story.

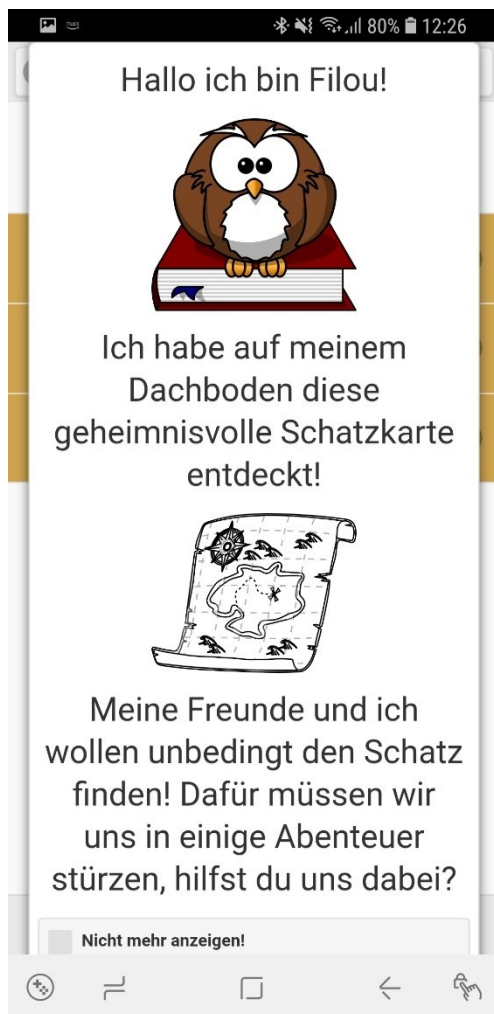


Figure 15: Introduction into the main story of Story Templates.

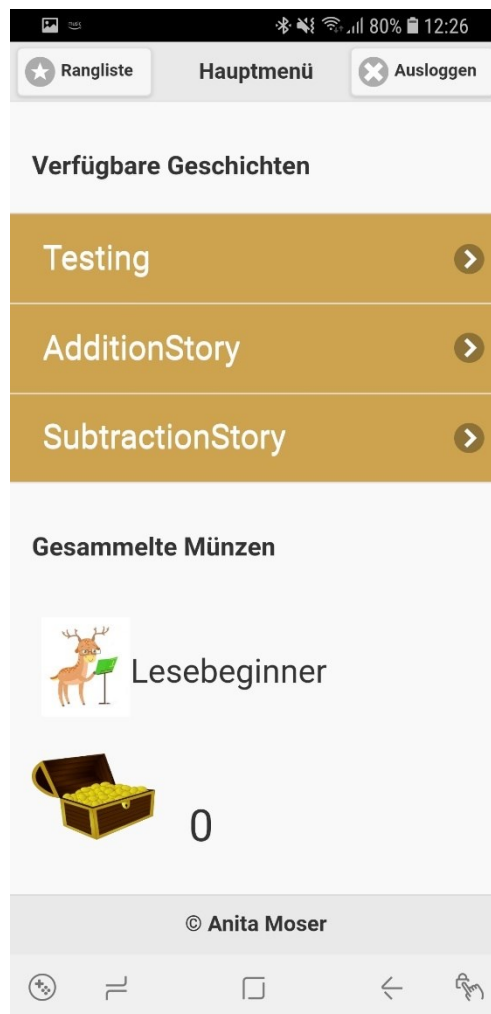


Figure 16: The main menu with available stories for the student.

Closing the pop-up leads the student to the main page of Story Templates. The core element in the main menu, shown in Figure 16, is the list with the available stories. In this list, all stories appear which did not reach the deadline. If a story is not solved yet, it is colored yellow. But if a story is already finished, it will be colored in a dark grey.

Underneath the story list, the collected coins and the achieved title is shown. The score next to the treasure box rises if the student completes the tasks inside a story correctly. If a certain amount of coins was collected, the student gets a new and better title.

If the student clicks on an available story, a pop-up appears which shows all available stories to read (Figure 17). When the student changes his decision, he can easily close the pop-up and click on another one. If the student chooses a story from the pop-up, the application switches to a new page which displays it. As it can be seen in Figure

18, a small pop-up with a friend of Filou welcomes the student to the new story. The picture of the animal is picked randomly from a picture pool for each story. The animal friend asks the student to solve the tasks inside the story to get a piece of the treasure as reward. The student can close the pop-up and start reading the story.

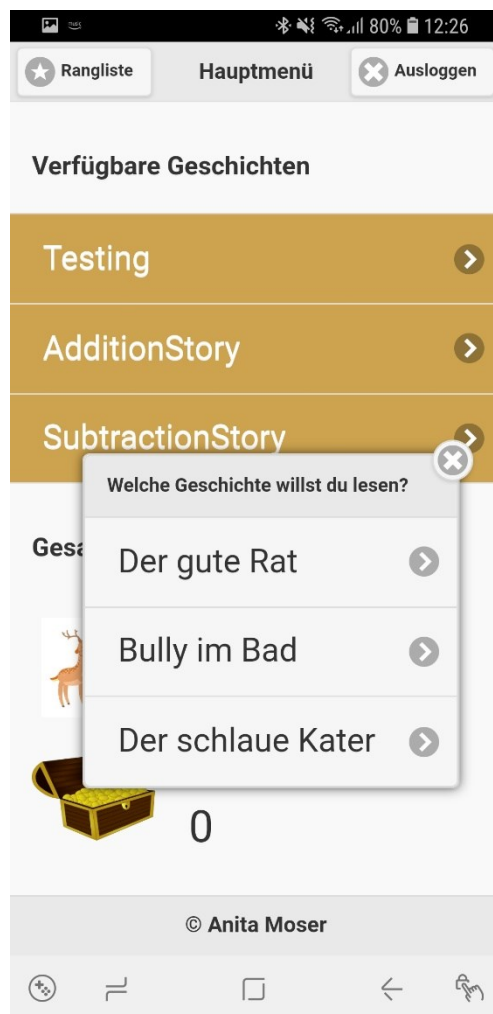


Figure 17: Pop-up which shows the available stories to read.

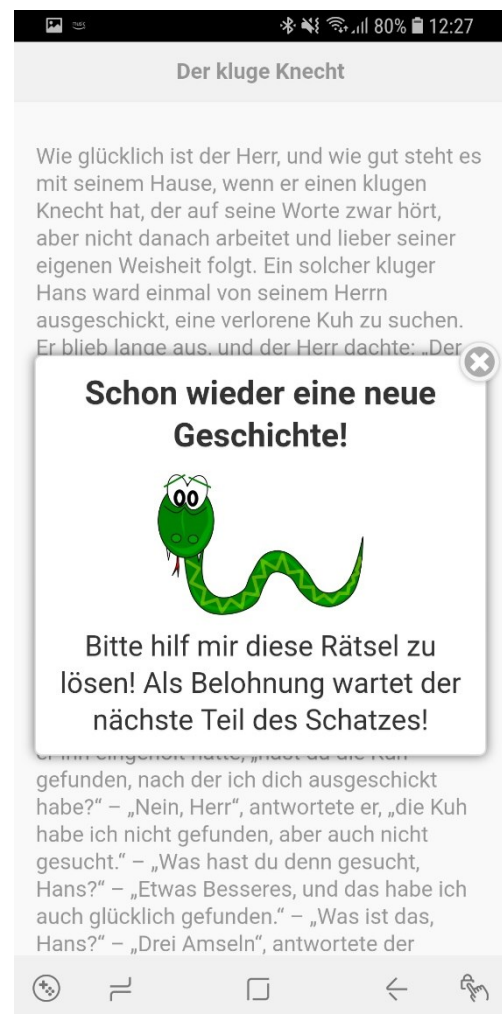


Figure 18: A pop-up welcomes the student to each new story.

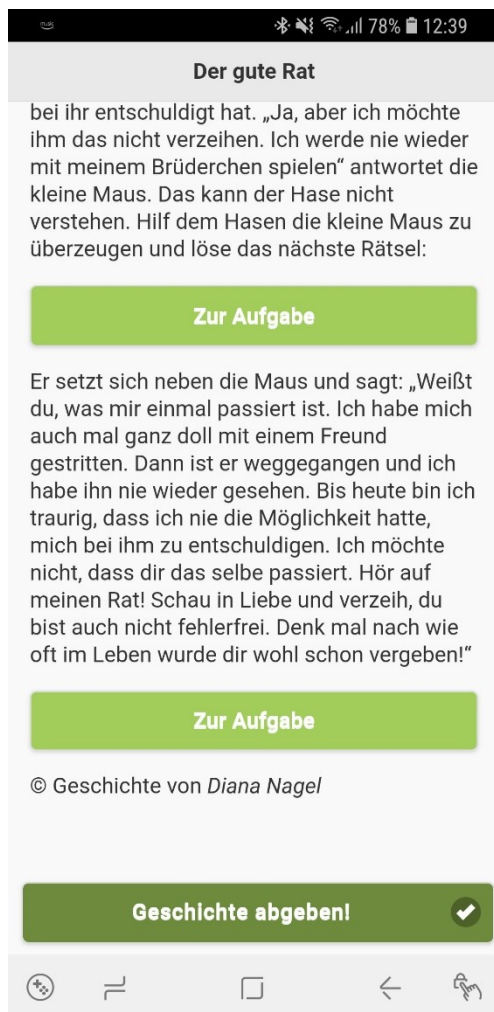


Figure 19: An example story with buttons for accessing the tasks.

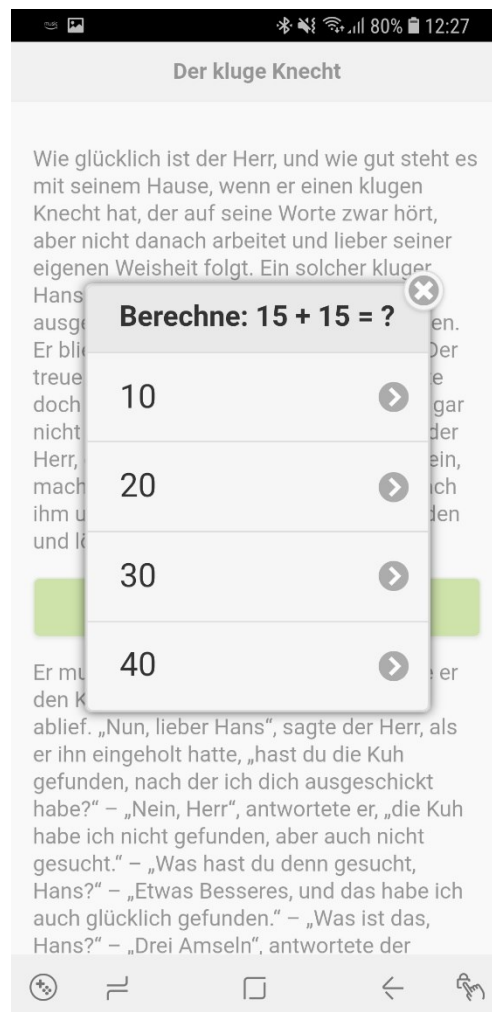


Figure 20: An example multiple-choice question inside a story.

The story is viewed and buttons for each of the tasks are integrated. At each break, a button is inserted which leads the student to the proper task. Figure 19 shows an example story where two buttons are integrated inside of the story. If a student clicks on a button for a task, a pop-up appears on the screen. Figure 20 shows an example task inside of the pop-up. The multiple-choice question consists of a header with the question and a list with the four answers. If the student clicks on one answer, it is automatically saved in the database. While solving the task, the student can change his decision and choose another answer. Aside from being a multiple-choice question, the task can also be a free answer (Figure 21). It consists of a header with the question and a text field for the answer of the student. At the bottom there is a button for saving the answer. After closing the pop-up, the student can continue reading and solving the following tasks.

At the end of the narrative there is a button which finishes the actual story. If a student clicks the last button, the story is marked as finished and the score is automatically calculated and updated. After this, the application hops back to the main menu and shows the story as closed. It is marked grey and the student cannot open it again.

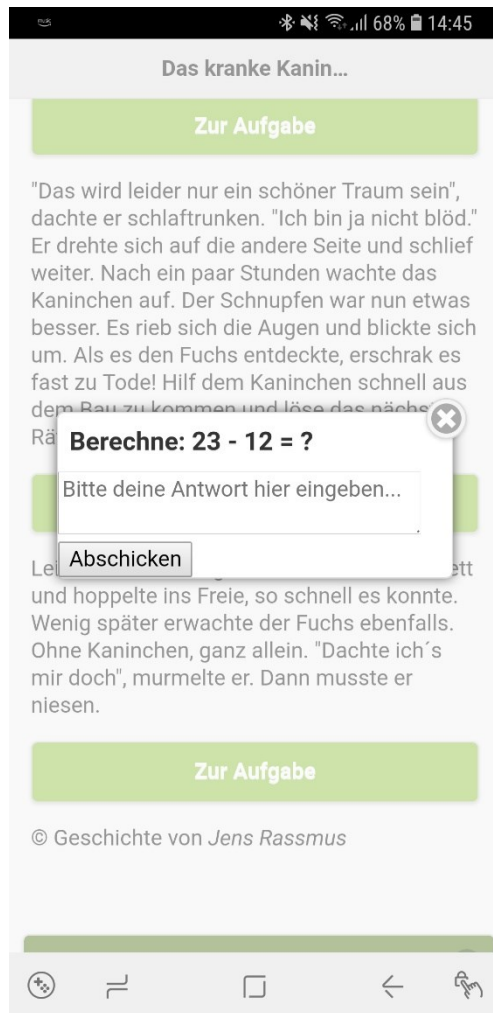


Figure 21: An example task with a free answer.

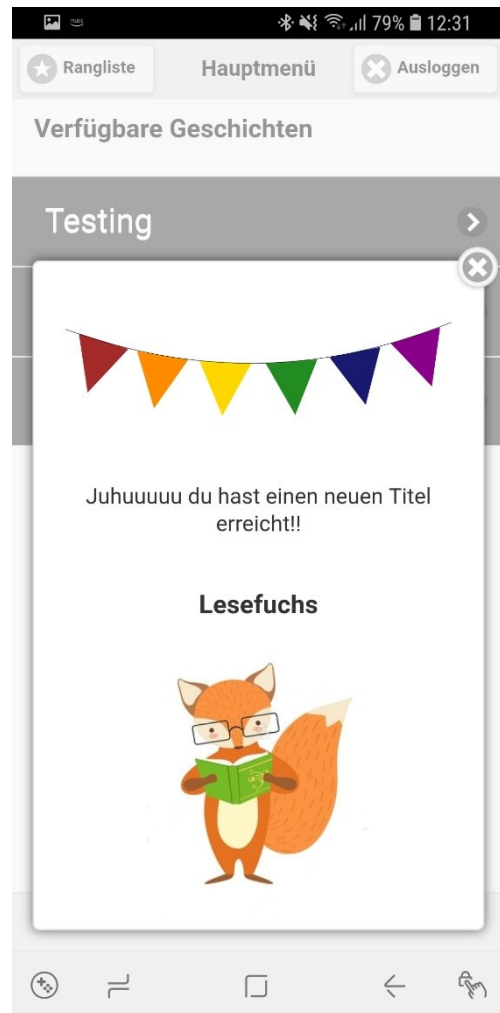
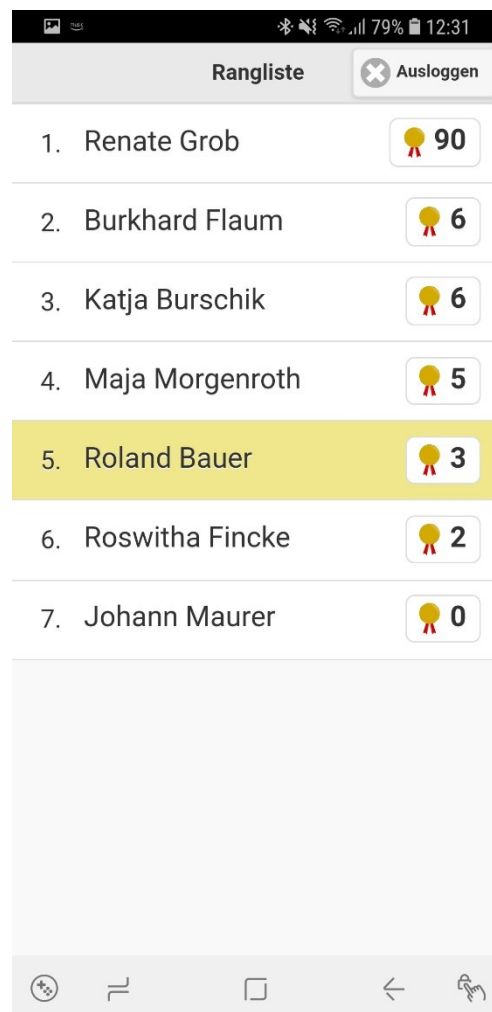


Figure 22: Notification of achieving a new title.

For each right multiple-choice answer, the student gets two coins. For filling out the free answer, he gets one coin. Even though the free answer is not controlled by the tool, the solving of it should still be rewarded. If a specific amount of coins is reached, the student climbs up in the ranking and gets a new title. The new title appears in a pop-up with a picture of a reading animal (Figure 22). For each title, there is a specific name and animal. The first title is reached easily after the first five coins. The next titles are reached after collecting the next 10 coins. Achieving a title should not take too long for the students, especially in the age of elementary school.

Collecting coins and achieving different titles should motivate the students to use Story Templates again and again. Furthermore, there is a ranking list which lists all students of the class with the number of their achieved coins. As shown in Figure 23 all students are ranked after their collected coins and the student who is actually logged in is highlighted. The ranking list should motivate the students to perform better than the other classmates.



Rangliste		Ausloggen
1.	Renate Grob	90
2.	Burkhard Flaum	6
3.	Katja Burschik	6
4.	Maja Morgenroth	5
5.	Roland Bauer	3
6.	Roswitha Fincke	2
7.	Johann Maurer	0

Figure 23: Ranking list of the class.

Implementation

As already mentioned, the mobile application is based on Apache Cordova and is also a website. In contrast to the teacher website, the mobile application only consists of one HTML page. By using jQuery mobile, the website is divided into several pages inside one document. Each page is a div with the role of a page. Inside these pages, any valid HTML can be used. Usually a page is subdivided with further divs like a

header or content. All specifications like the title or adding scripts to the website stay the same, only the subdivision of each page is given.

```
<div data-role="page" id="rankingListPage">
  <!-- header -->
  <div data-role="header" data-position="fixed">
    <h1>Rangliste</h1>
    <button data-icon="delete" class="ui-btn-right"
id="logoutButtonRanking">Ausloggen</button>
  </div>

  <!-- content -->
  <div data-role="content">
    <ol data-role="listview" id="rankingListView"></ol>
  </div>
</div>
```

Listing 4: Example of a simple page of Story Templates.

Listing 4 shows a page which is responsible for viewing the ranking list for the student. The main div has the role of a page and therefore views a new page when it is called by clicking the button in the main menu. Inside of the main page of the ranking list, it is divided into a div for the header and a div for the content. The header holds the name of the page and a button for logout, which is located in the right corner of the header. Furthermore, the header is fixed, which defines that the header should always be shown, also when scrolling down. The next div holds the main content of the page. It consists of an ordered list which gets the content dynamically from jQuery mobile and is empty inside of the HTML page. The information is loaded into the list by jQuery mobile and not HTML.

The structuring with jQuery mobile was very easy and fast. Having all pages inside one document offered a great overview. Furthermore, it offered good CSS classes for different roles and in particular respects varying screen sizes. All buttons or fields are designed for the use on devices like phones or tablets.

With jQuery mobile, all functionalities of the application were implemented. The structure and syntax are like normal jQuery. There are just some exceptions like the page handling. Instead of changing the actual HTML file, only the pages need to be updated inside one main file via jQuery. The AJAX requests can be sent like the ones on the teacher website, showed in Listing 2.

Creating a new mobile project with Apache Cordova was mostly easy and fast. After specifying the platforms which should be used, for example Android, a new sample project is created. If a specific platform is chosen, the proper SDK (Software Development Kit) has to be available on the computer. When everything is implemented as desired, the whole project can be compiled and built in the console. If the build was successful, the tool creates the application file, for example the “.apk”-file for Android. This file can be copied to a phone, a tablet or provided somewhere for download.

The implementation of the mobile application was basically the same effort as building a website. Only the framework Apache Cordova and its functionalities needed more time. Especially compiling and building the application for the first time delivered many errors.

All in all, the framework was perfect for implementing a responsive mobile application. It offered a great way for communicating between the website of the teachers, the mobile application and the database.

5.4 The Database

As mentioned above, the database was created with MySQL and its workbench. All information is saved in this database and can be accessed by the website or mobile application. The database consists of several tables which hold different information about stories, students, teachers etc.

The following list explains all existing tables and their data:

- *teachers*
 - The table holds all information about the teachers. If a teacher registered for Story Templates, a new ID is assigned, and the further details are saved.
- *students*
 - All information about a student is saved in this table. Each student gets a unique ID for identification. Furthermore, the teacher and the class are assigned for each student. The login details and the full name are saved too.
- *classes*

- All classes with a unique ID and the associated teacher are saved.
- *stories*
 - This table holds all information about the original stories. Each story has its own author, name and the partitioned parts of the content. Furthermore, the difficulty, the category and the number of partitioned parts are saved.
- *readystories*
 - If a teacher creates a story with the desired templates, the finished story is saved in this table. All available stories, all template IDs and characteristics of the story are saved. Those characteristics include things like the deadline, the subject or the kind of learn control.
- *storiesforclasses*
 - This table is responsible for holding information about the answers of each story and student. If a teacher sends a finished story to a class, a row for each student is created. This row saves the ID of the story, the ID of the student and if the story was completed. Given that, a story can hold a maximum of nine tasks, each row has nine columns where each answer is saved into the fitting column. The statistics page can easily access this table and evaluate the answers for each student.
- *templates*
 - Each created template is saved and gets a unique ID. The type of the template, the subject and the category are saved. Furthermore, each row holds the question and the answers if it is a multiple-choice template. In this case, the right answer has to be saved too.
- *scores*
 - Each student gets a row which holds the information about his score and the achieved title.
- *categories*
 - All available genres for stories are saved and assigned with a unique ID.
- *subjects*
 - This table saves all available school subjects and its subcategories.

While developing and implementing Story Templates there were multiple changes in the database. From starting with two databases, one for the stories and one for the students, the database was designed more compact and smaller.

6 Experimental Evaluation

Story Templates was evaluated to investigate the question if the tool motivates students to repeat learning content and if the stories are a motivational factor for them. Furthermore, the usability was tested and if the tool is not only serious, but also fun for the students. For evaluating Story Templates, it was tested with a class from an Austrian elementary school.

For testing if the stories have an impact on the motivation of the participants, they were separated into two groups. The first group (10 participants) tested the full mobile application of Story Templates, which includes reading stories with the embedded tasks. The second group (6 participants) tested a modified version of the mobile application. This group only got the tasks, without stories.

The application was available for the class for a period of two weeks. At first each group was introduced to the tool in the computer room of the school. They got a short explanation what it is about and were free to test Story Templates for 25 minutes. After this introduction, the teacher was able to use the tool at his desire for the next two weeks. At the end of the testing time, all participants got the same questionnaire about their motivation. Given that, we did not get the complete information from all participants, the size of all participants reduced and subsequently the groups were separated uneven.

Participants

Overall, we were able to evaluate the tool with 16 participants from the elementary class. The children were in the second grade and able to read short stories fluently. As it can be seen in Figure 24, the age varied between 7 to 9 years. The gender ratio in the class was not evenly distributed. Figure 25 shows that there were more female participants than male ones.

Providing anonymity, the children had to fill in the questionnaire by themselves and state if they were in the group with or without stories. Although the division of the two groups were almost equal at the testing, the division was not equal on the questionnaires. As it can be seen in Figure 25, the group of participants with stories is bigger than the group of participants without stories.

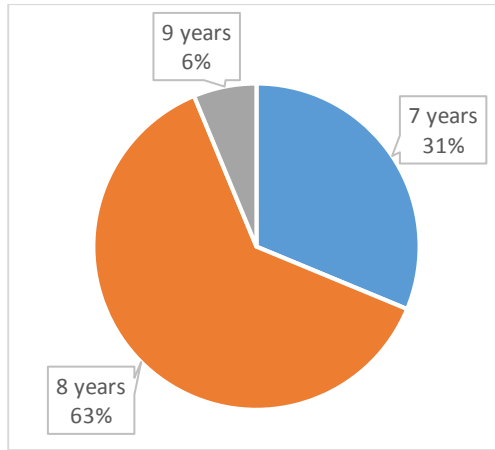


Figure 24: Age of the participants.

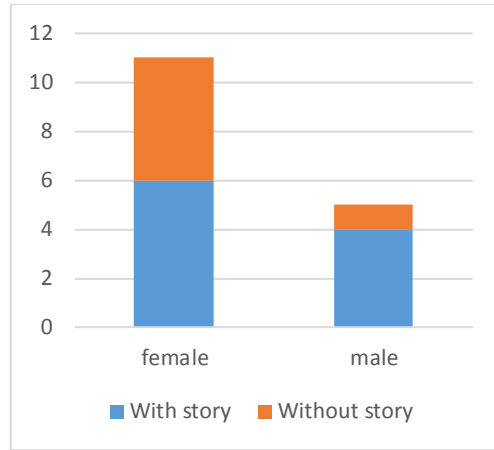


Figure 25: Gender of the participants.

Given that the elementary school has no access to WIFI, the testing took place in the computer room. All participants were affine on computers and knew how to use it. The questionnaire at the end of the testing phase was filled in anonymous by the children with the help of a teacher.

Questionnaire

The questionnaire was created to get some information about the motivation of the children. The complete questionnaire can be seen in the Appendix. At the beginning, it asked about the gender, the age and the associated group. The main content of the questionnaire were 10 statements. Those statements could be rated by choosing a proper smiley. Figure 26 shows the possible options where each smiley represents if the participant is according with the statement or not. The following four descriptions were used for the smileys from left to right: “I strongly agree”, “I agree”, “I disagree”, “I strongly disagree”.

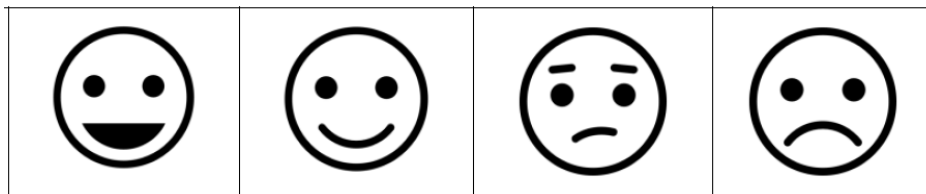


Figure 26: Scale for rating the statements.

With the help of this scale the answers were evaluated and interpreted. The following statements were used for the questionnaire:

1. "I tried hard solving the tasks."
2. "I had fun while solving the tasks."
3. "I was very good in solving the tasks."
4. "I was bored during solving the tasks."
5. "It was important for me to score well while solving the tasks."
6. "I had problems solving the tasks."
7. "I was happy with my result."
8. "I think the tasks are interesting."
9. "I would like to solve such tasks again."
10. "I had troubles using the tool."

For each of these statements, the participant had to choose from the scale. Given that, the participants were young children in elementary school, the questionnaire was held short and easy.

Results

The main goal of the experimental evaluation was to evaluate if stories are a motivational factor and if Story Templates motivates children to learn. The statements in the questionnaire handle different topics to test the motivation of the participants. To motivate a student, many factors collude. As already mentioned in section 2, fun, entertainment and satisfaction play an important role to play a game again. Those factors were part of the questionnaire and provide information about the motivational aspect of Story Templates. To see if stories affect the motivation of the students, the participants were separated into the two groups. For simplifying the group names, the group with stories is called Group A and the Group without stories is called Group B.

One of the most important questions while evaluating was if the participants had fun while using Story Templates. Independent of the evaluation group, all participants had fun while playing it. As the pie charts in Figure 27 and Figure 28 show, all participants strongly agreed or agreed that they had fun while solving the tasks. Although Group B had no stories to read, they still had fun only by solving the tasks on the computer. However, the percentage of participants who strongly agree is still higher in Group A, who had to read stories.

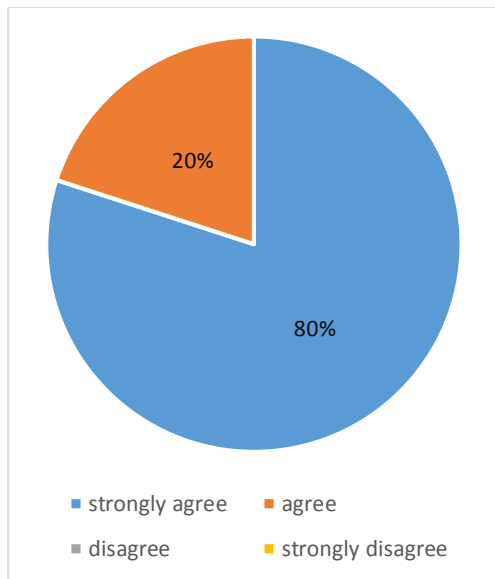


Figure 27: Group A asked if they had fun while solving the tasks.

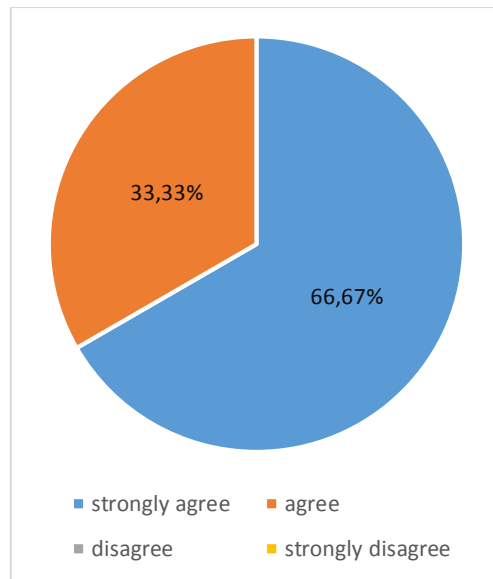


Figure 28: Group B asked if they had fun while solving the tasks.

In contrast of asking the participants if they had fun while playing Story Templates, they should state if they were bored while solving the tasks. Although all participants had fun, some participants stated that they were bored while solving the tasks.

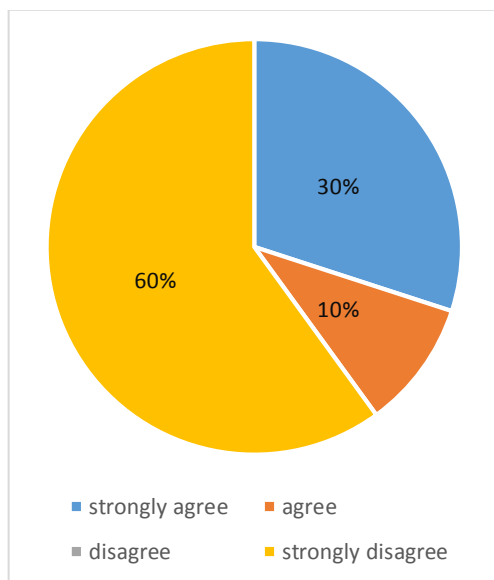


Figure 29: Group A asked if they were bored solving the tasks.

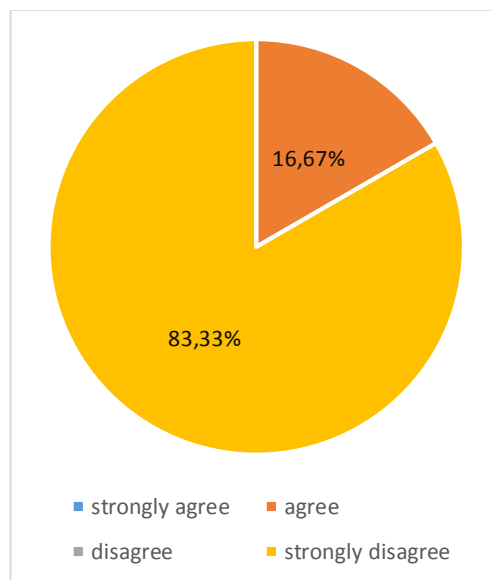


Figure 30: Group B asked if they were bored solving the tasks.

Shown in Figure 29, 40% of the participants in Group A were bored. On the other hand, 83% of the participants in Group B strongly disagreed that they were bored

(Figure 30). However, the bigger part of all participants was not bored during solving the tasks. The participants who stated they were bored, eventually did not like the stories or they may have been too long. Maybe the templates were too easy, which also could have led to boredom. Although all participants stated that they had fun while solving the tasks, a view stated they were bored. There may have been some misunderstandings while filling in the questionnaire.

Another important question was if the participants would like to solve such tasks again. Overall, the participants strongly agreed or agreed with this statement. As showed in Figure 31, only 20% of the participants in Group A do not want to solve tasks like this again. Figure 32 shows that all participants in Group B agree on this statement and confirm they would like to solve the tasks again. The results show that almost all participants are motivated through Story Templates to solve tasks with learning content.

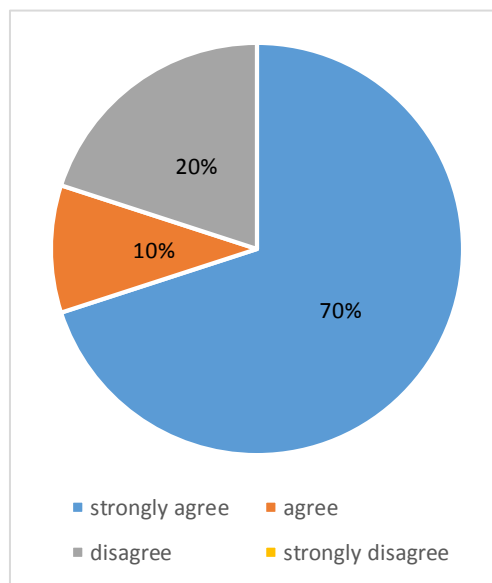


Figure 31: Group A about solving such tasks again.

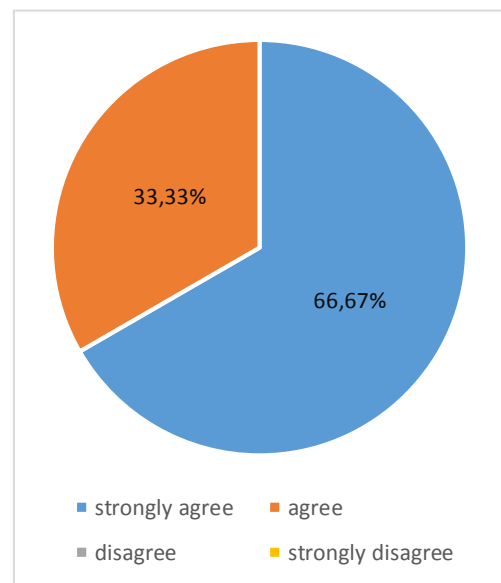


Figure 32: Group B about solving such tasks again.

Another important point was if the participants had problems solving the tasks. The majority of both groups disagreed on this statement. As shown in Figure 33 and Figure 34 there were also participants who stated that they had problems while solving the tasks. In Group A there are more participants who had troubles than in Group B. There may have been problems because of too difficult tasks or the usability.

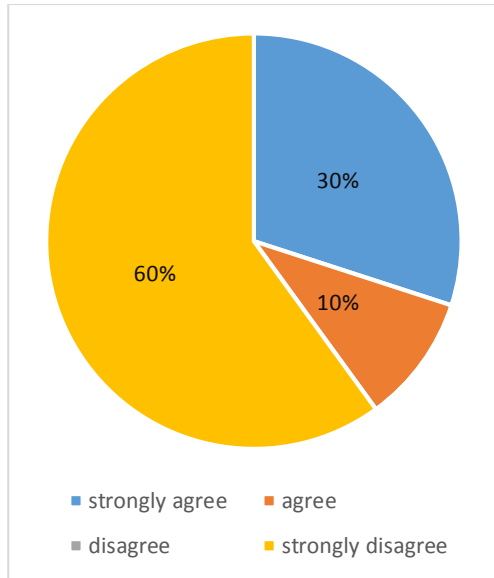


Figure 33: Group A asked if they had problems solving the tasks.

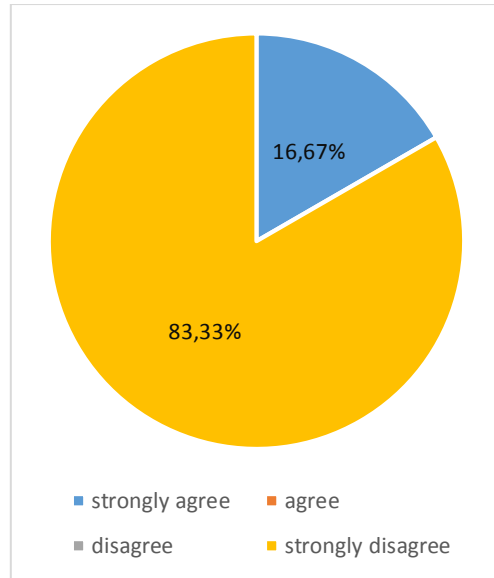


Figure 34: Group B asked if they had problems solving the tasks.

Evaluating and testing the usability of Story Templates, the participants had to state if they had problems using Story Templates. Shown in Figure 35, Group A had more troubles using the tool than Group B (Figure 36).

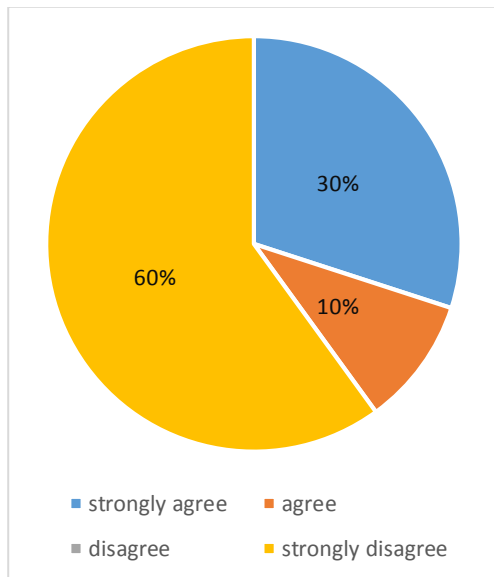


Figure 35: Group A asked if they had problems using Story Templates.

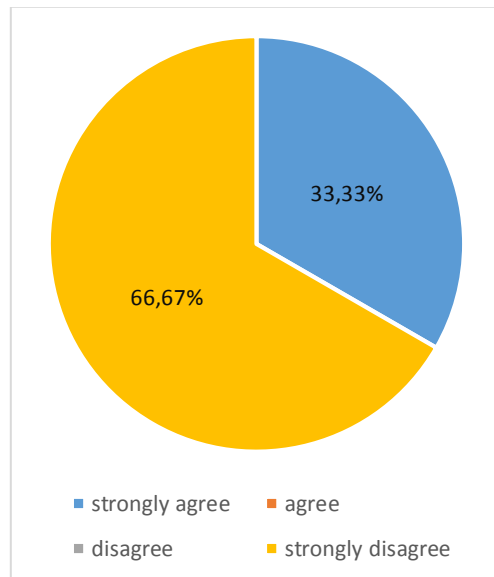


Figure 36: Group B asked if they had problems using Story Templates.

But the majority of all participants had no problems using Story Templates. This result approved that the usage of the tool is easy for most of the users. But there may have to be some simplifications and improvements to satisfy the rest of the users.

Ambition is one reason to play a game again and stay motivated. Therefore, the participants had to state if it was important for them to score well while playing Story Templates. Figure 37 and Figure 38 show that the bigger part of the participants was ambitious to score well. In Group A only 20% disagreed and in Group B it was only 16% of the participants. It shows that the participants are really ambitious, which can raise the motivation significantly.

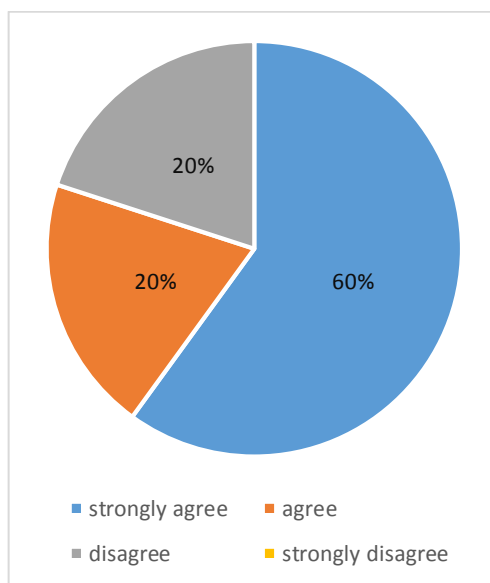


Figure 37: Group A asked if it was important for them to score well.

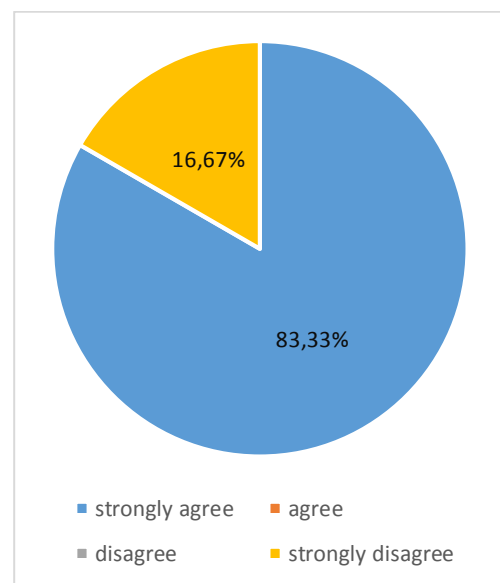


Figure 38: Group B asked if it was important for them to score well.

Another factor for motivation is trying to be the best player in the game. For this, the player has to try hard to reach points or certain scores. For evaluating this factor, the participants had to state if they tried hard solving the tasks. All participants from Group A (Figure 39) agreed with this statement, where only 17% in Group B (Figure 40) disagreed on it. This result showed that the participants are really ambitious to answer the tasks right and get a better score.

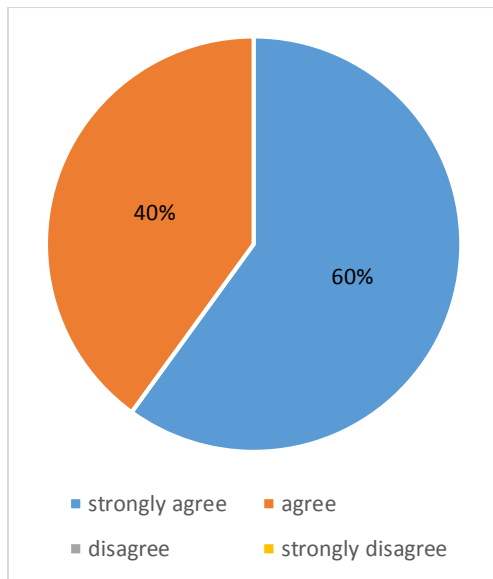


Figure 39: Group A if they tried hard solving the tasks.

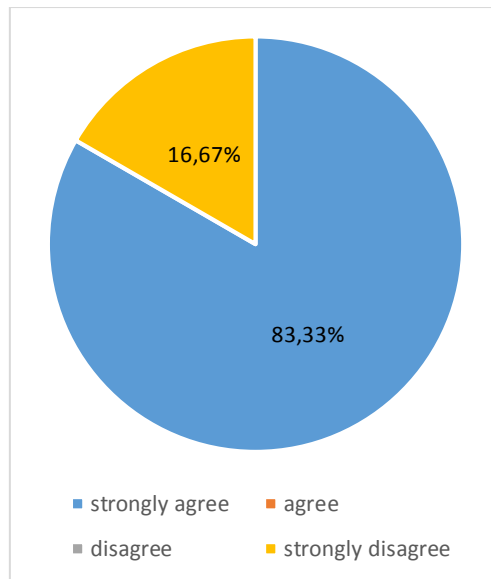


Figure 40: Group B if they tried hard solving the tasks.

For evaluating the self-evaluation, the participants were asked if they think they were very good in solving the tasks.

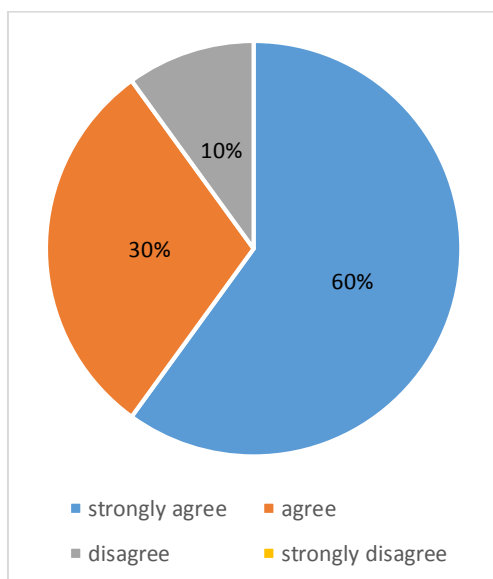


Figure 41: Group A if they think they were very good in solving the tasks.

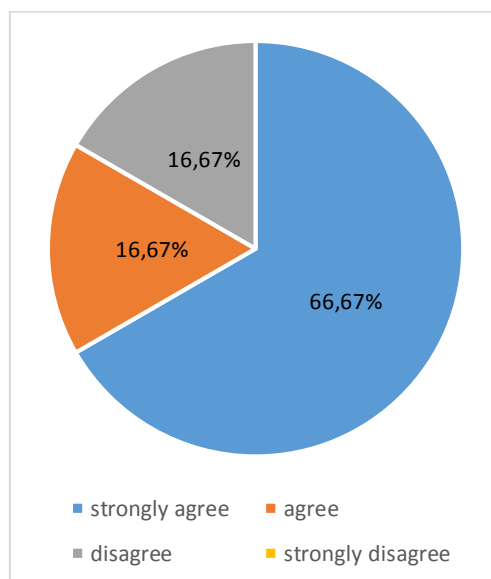


Figure 42: Group B if they think they were very good in solving the tasks.

In Group A 90% estimated themselves as very good at solving the tasks (Figure 41). Furthermore, in Group B about 83% agreed with this statement (Figure 42). The

participants had a high self-evaluation, which can motivate them to use Story Templates again because they think they are good at solving the tasks.

In addition to self-evaluation, the participants had to state if they were satisfied with their results after solving the tasks. All participants, independent of the group, agreed with this statement. This showed that everybody was happy with their results. If a player is satisfied with his results after playing a game, he will be motivated to play it again. From this result it can be concluded that this factor raises the motivation to use Story Templates again to repeat learning content. Furthermore, it was important to know if the participants think that the tasks were interesting for them. All participants agreed that the tasks were interesting.

Given that our evaluation did not show clear significant results, the tool needs more testing with future users to confirm our interpretations.

Summary

The results of the experimental evaluation were good and mostly confirmed our aims and ideas. But, there were no major differences between the two evaluation groups. This leads to the assumption that the embedded stories are not the main motivational factor for playing Story Templates. The main factor is the usage of digital devices or computers in combination with entertainment. Given that, the majority of participants had fun and enjoyed Story Templates, it can be concluded that the tool really motivates students to repeat learning content. But, there is also room for improvement, especially for the usability. The evaluation showed that some participants had troubles using the tool. To remove them, the tool needs improvement and further testing to make it suitable for more users. Given that, the majority of all participants wanted to solve such tasks again, it confirms that the tool animates students to learn with it on choice. All in all, the evaluation showed that the tool is a good alternative to traditional learning methods to repeat learning content. Although the stories are not the main motivational factor, they strengthen the reading competence and are a benefit for the application.

For getting significant results, the tool needs further tests and evaluations with future users.

7 Conclusions and Future Work

The main goal of the project Story Templates and this master thesis was to develop an e-learning tool for students which raises their motivation to repeat learning content and simultaneously strengthen their reading skills. The tool should not replace traditional teaching, it was developed to extend today's teaching methods to adapt to the digital age. Given that, the new generation grew up with new media, the aim of Story Templates is to integrate those into classrooms.

This thesis covered the functionalities and implementation details of the e-learning tool Story Templates. Tools and games with similar approaches were introduced, which are already used in modern classrooms. The fundamentals were discussed with various literature and gained an insight into the topics which surround Story Templates. The research presented showed that traditional learning methods need to be adapted for the new generation. Digital media gives new motivation and brings variety into classrooms. However, traditional learning methods, like reading a book on paper, should not be replaced rather than being extended.

Story Templates is a good alternative to repeat learning content during instruction or as homework with low effort for the teacher. The experimental evaluation with 16 students from elementary school indicates that it motivates them to solve tasks by offering gamification and exciting stories. Furthermore, the students had fun while playing and enjoyed spending time on Story Templates. It suggests that integrating modern media into classrooms can lead to new motivation for reading and learning. Apart from the positive aspects of the evaluation, there is also the need to adapt the tool for providing a better usability to satisfy more users. Given that, some participants were bored during solving the tasks, the tool could be extended with more creative tasks, for example with pictures or animations. This would make the tasks more attractive and diversified. Although the main goal of the tool is not fun and entertainment, it should provide enough of it to motivate students to play it again. For improving Story Templates and for achieving significant results, it needs more testing with future users.

The e-learning tool Story Templates offers a new way to extend common teaching methods to motivate students to read and learn with the help of modern technology.

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Appendix

Fragebogen zur Motivation

Ich bin ein... ☐ Junge. ☐ Mädchen.

Ich bin _____ Jahre alt.

Ich habe die Aufgaben mit Geschichten gelöst: ☐ Ja ☐ Nein

Bei den Aufgaben...				
... habe ich mir Mühe gegeben.				
... hatte ich Spaß.				
... war ich sehr gut.				
... war ich gelangweilt.				
... war es mir wichtig gut abzuschneiden.				
... hatte ich Probleme sie zu lösen.				
... war ich zufrieden mit meinem Ergebnis.				
Ich finde die Aufgaben interessant.				
Ich würde diese Aufgaben gerne öfter machen.				
Ich hatte Probleme bei der Bedienung.				