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Michael Schweiger BSc

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Abstract

The high number of asylum seekers has led many countries to focus on how to integrate them quickly into their societies. The answer to this question is access to education. It is especially important for young people to build social connections. Schools can help by establishing new contacts and friendships. For a successful integration process, the language of the country of immigration must be learned as a so-called second language. Many countries have special classes for this purpose. In German-speaking countries, it is the so-called German as a second language (GSL) instruction, known as "DaZ-Klassen (Deutsch als Zweitsprache)". Students in these classes must reach a certain level of language competence in order to be integrated into regular instruction, where they receive the full range of educational services.

That computer programes could be relevant in the field of language acquisition was realized already in the 1980s. The term CALL (Computer-assisted language learning) was defined. The technical development and the introduction of mobile devices led to the adoption of the acronym MALL (Mobile Assisted Language Learning). As a result of this evolution, gamification also became more and more popular. By using various game elements, serious tasks such as school activities or work tasks should be made more game-like. This should increase people's engagement and motivation in implementing their tasks and activities.

In this thesis, the topic of second language acquisition using a digital learning game is examined in more detail. First, the most important terms in the field of gamification and Game-Based Learning (GBL) are described. Research in the area of motivation plays a major role in this context. Consequently, the difference between intrinsic and extrinsic motivation is shown and relevant theories in this area are explained in more detail. This is followed by an overview of already written works and conducted studies in these research fields. The learning game "Lernen&Spielen", which was implemented in the course of this work and used in GSL instruction to perform a detailed study. The focus was on determining whether learners show more motivation and engagement in relation to the serious task of language learning through the use of a digital tool that purposefully employs game design elements. In addition, the methodological procedure and the implementation of the study are described in detail. The realization of the learning game and applied game design elements are addressed. Finally, the results of the study are presented and discussed. This is followed by a summary and an outlook where possible further work is discussed.

Kurzfassung

Die hohe Anzahl an Asylwerbern hat viele Länder dazu veranlasst, sich mit der Frage zu beschäftigen, wie sie diese schnell in die Gesellschaft integrieren können. Die Antwort auf diese Frage ist: Integration dieser Menschen in das Bildungssystems des jeweiligen Landes. Besonders für junge Menschen ist es wichtig soziale Kontakte zu knüpfen. Schulen können sie dabei unterstützen. Damit der Integrationsprozess erfolgreich ist, muss die Sprache des Einwanderungslandes als sogenannte Zweitsprache erlernt werden. In vielen Ländern gibt es bereits spezielle Klassen, welche Asylwerbern die Sprache des Landes lehren, um sie früher oder später in den Regelunterricht eingliedern zu können. In deutschsprachigen Ländern werden sie als DaZ-Klassen (Deutsch als Zweitsprache) bezeichnet. Schüler müssen ein bestimmtes Sprachniveau erreichen, damit sie in den regulären Unterricht integriert werden können, wo sie das gesamte Spektrum an Bildungsleistungen erhalten.

Dass Computerprogramme für das Erlernen einer Sprache von Bedeutung sein können, wurde bereits in den 1980er Jahren erkannt. Der Begriff CALL (Computer-Assisted Language Learning) wurde definiert. Durch die technischen Entwicklungen und das Aufkommen von mobilen Geräten wurde MALL (Mobile Assisted Language Learning) als Akronym zu CALL eingeführt. Zusätzlich erfreut sich „Gamification“ immer größerer Beliebtheit. Dadurch können mithilfe verschiedener integrierter Spielelemente ernsthafte Aufgaben, wie Schulaktivitäten oder Arbeitsaufgaben, spielerisch gestaltet werden. Dies soll das Engagement und die Motivation der Menschen bei der Durchführung dieser Aufgaben und Aktivitäten erhöhen.

In dieser Arbeit wird die Thematik des Erwerbs einer Zweitsprache mit Hilfe eines digitalen Lernspiels näher beleuchtet. Zunächst werden die wichtigsten Begriffe aus dem Bereich „Gamification“ und „Game-Based Learning (GBL)“ beschrieben. Die Forschung im Bereich der Motivation spielt dabei eine große Rolle. Der Unterschied zwischen intrinsischer und extrinsischer Motivation wird aufgezeigt und relevante Theorien in diesem Gebiet näher erläutert. Es folgt ein Überblick über bereits verfasste Arbeiten und durchgeführte Studien in diesen Forschungsbereichen. Das im Rahmen dieser Arbeit entwickelte Lernspiel „Lernen&Spielen“ wurde in einer begleitenden Studie im DaZ-Unterricht eingesetzt. Dabei soll vor allem die Frage geklärt werden, ob Lernende durch den Einsatz eines digitalen Tools, das gezielt Spielelemente einsetzt, mehr Motivation und Engagement in Bezug auf die ernsthafte Aufgabe des Sprachenlernens zeigen. Darüber hinaus werden das methodische Vorgehen und die Durchführung der Studie detailliert beschrieben. Es wird auf die Umsetzung des Lernspiels und die verwendeten Game-Design-Elemente eingegangen. Schließlich werden die Ergebnisse der Studie vorgestellt und diskutiert. Es folgen eine Zusammenfassung und ein Ausblick, wo mögliche weiterführende Arbeiten diskutiert werden.

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Chapter 1

1. Introduction

Learning a second language is becoming more and more important in today's world. According to the "Asyl Statistik" of the Austrian Federal Ministry of the Interior, 238,755 applications for asylum have been submitted from 2015 until January 2022. Of these, slightly over 90,000 were teenagers younger than 18, nearly 23,000 of them were unaccompanied minors. If one looks at the statistics for asylum applications in the EU member states in the period from 2015 - September 2021, one gets a staggering number of 5,407,102 applications. Two million of these applications were made in Germany [3]. It is particularly important for young people to be able to integrate quickly into the society of the country of immigration. For this undertaking, access to and integration into the education system is a key factor. However, this can only succeed if these children also learn the language of the country as a second language [4].

Already in the 1980s it was realized that computer programs could be relevant for language education. The term CALL (Computer-assisted language learning) emerged, which Beatty defined as follows: *"any process in which a learner uses a computer and, as a result, improves his or her language"* [5, p. 7]. Due to the advancing digitalization and the increasingly easy access to the Internet, so-called acronyms for the term CALL emerged, trying to adapt it to the developments. Some of them are: WELL (Web-enhanced Language Learning), TELL (Technology Enhanced Language Learning) or NBLL (Network-based Language Learning). However, these terms did not really differ from the term CALL in the background. It is still assumed that a computer (laptop or desktop computer) is used to specifically learn a language. The immense use of portable devices such as smartphones has added another acronym, MALL (Mobile Assisted Language Learning). This term is intended to express that through so-called OMDs (Other Mobile Devices) new learning methods arise, which can be used more easily [6]. Jarvis and Achilleos [6], however, believe that this term is not appropriate either. In their study, they asked students who were studying at a UK university but whose native language was not English, what programs and devices they use and whether they believe that using the language English "unconsciously" improve their language skills. Of the 56 participants, all indicated that OMDs or computers are essential for them. 71.4 % of the respondents believe that using the language to be learned in real life is more beneficial than predetermined learning packages. In addition, the interviews revealed, that many students listen to music and chat with friends via various media while completing a task. Based on these results, it is argued that CALL or MALL is no longer up to date, because it is no longer just a computer and a software program that is used for language learning. They therefore introduce a new term MALU (Mobile Assisted Language Use), which they define as *"non-native speakers using a variety of mobile devices in order*

to access and/or communicate information on an anywhere/anytime basis and for a range of social and/or academic purposes in an L2" [6, p. 9]. In this context, L2 means second language. With the establishment of apps, a new approach to increasing the motivation of learners was developed. It is a subfield of CALL and is called gamification. In [7], gamification is defined as *"the process of making activities in non-game contexts more game-like by using game design elements"* [7, p. 372]. Several studies show that activities which are implemented in a playful way increase the engagement and motivation of learners. Thus, gamification can also be interesting for teachers in the field of second language instruction [8]. But it turns out that young and inexperienced teachers would rather reject the use of digital games in the field of education than use these tools incorrectly in the classroom [1].

In this thesis, first, the most important terms in the field of gamification and game-based learning will be clarified. Furthermore, with a look at the self-determination theory, it will be explained which needs are essential for people and how these can be used to increase motivation in relation to a learning game by trying to satisfy them using different game elements. The results of relevant studies in this area will also be presented and discussed.

Furthermore, the learning game "Lernen&Spielen", which was developed in the course of this work, is used in practice. Students of a German as a second language (GLS) course use the tool to practise their skills and improve their language level. In particular, the user behavior of the participants is examined by analysing the game data and evaluating questionnaires, which are answered by the students at the beginning and at the end of the study. In the context of this thesis, the following main research question (RQ1) and the two secondary research questions (RQ2, RQ3) are to be answered.

Research question 1

Do gamification elements integrated in a digital learning game which is used in the course of German as a second language instruction have an impact on the motivation and engagement of the participants with regard to the serious task "language learning"?

Research question 2

What is the state-of-the-art in research regarding digital learning games in relation to language learning?

Research question 3

What do learners, teachers and parents think about the issue "digital learning games"?

Chapter 2

2. Key terms in this research area

As mentioned in chapter 1, it is important to understand and to be able to distinguish the main terms in this research area from each other. The term gamification refers to adapting any context through the use of game elements in such a way that it results in an increase in motivation and engagement for participants. It is possible to gamify any activity, it does not have to be an educational task [8]. Another term which needs to be understood is Game-Based Learning (GBL). This expresses the fact that for achieving certain goals in the field of education, particular games are used [8]. When digital games are used specifically for learning a language, the process is called Digital Game-Based Language Learning (DGBLL) [1].

In all the previously described terms, the word "game" occurs in some form and context. However, not all games pursue the same goals, and it is necessary to distinguish between them. In this context, the focus is only on digital games:

Commercial off-the-shelf (COTS) games: These applications are primarily for entertainment and not specifically designed to fulfill educational goals. Nevertheless, this type of games can also be used to learn educational values. An example of this would be WoW - World of Warcraft, which has also been investigated in some studies in relation to language learning. It has been shown that the biggest gain is not directly from playing such MMO (massively multiplayer online) games, but from non-game activities performed in the context of the game. One such activity could be discussing specific game content in a community forum [9].

Games for educational purposes – serious games: The focus of these games is clearly on education and the achievement of goals in this context. Elements intended to entertain are also used, but the educational purpose is clearly in the foreground. But this is often the problem with serious games. Players (learners) usually see a task in it rather than a game, which they have to fulfill. The look and feel of this type of games cannot keep up with COTS games. Which is understandable in a certain way, because big games like WoW are programmed by a very large team of developers, which is often not available for serious games. Thus, there will be no game flow, which is harmful to the motivation and engagement of learners in relation to a game [9].

EDUGAMES - Educational games: These types of games are developed by educators themselves [1]. Involving educators in the development process of an educational game offers several advantages. In terms of language learning, for example, the level of lan-

guage to be used can be explicitly stated. Additionally, certain aspects of language learning can be given more attention than others. It is possible to program only an educational game that focuses on learning vocabulary. By being able to explicitly set goals, a so-called EDUGAME can be more easily integrated into a curriculum than a COTS or serious game, where as a teacher one does not really have an influence on game use or game play. In addition, students can also be directly involved in the creation process of an EDUGAME. In this way, students train their media skills and the game may include the "right" game elements to meet the needs of the target group by involving students of the same age in the creation process. That may increase at the end the engagement and interest of learners in the game [9].

Chapter 3

3. Game elements, motivation and psychological needs

When it comes to finding the right game elements for a digital (learning) game, one inevitably encounters research in the field of motivation, especially self-determination theory [10]. It has been shown that it is important to distinguish between two types of motivation, intrinsic and extrinsic [11].

Extrinsic motivation

Learning motivation itself refers to the fact that goals are to be achieved by learning certain contents and acquiring specific skills. If the target does not lie directly in an activity, but arises as a consequence of it, this is referred to as extrinsic motivation. However, the extrinsic type of learning motivation can also be further subdivided:

- **Performance-based:** The goal of learning is to achieve a good result in a subsequent exam.
- **Competence-based:** The goal of learners is to expand their competencies. They are oriented to the performance achieved in the past.
- **Competition-based:** The level of performance to be achieved is based on a group (e.g. the school class). The goal is to be better than others or to demonstrate that one has mastered certain skills better than the reference group.
- **Social-based:** As a learner, one wants to achieve acknowledgement on a social level. One performs an activity carefully because, for example, one wants to be praised by people who are important to one.
- **Work-related (material attributes):** Persons who are driven by this kind of extrinsic motivation learns, because later in their job they want to get prestige and earn good money.
- **Work-related (content-based):** One would like to fulfill one's career aspirations. Therefore, one learns especially for these things, needed later in this job area. [11].

Intrinsic motivation

Intrinsic motivation leads to the performance of a (learning) activity because as a result positive experience states are achieved. This means that a person experiences their own

motivation during playing, which is not driven from external influences [11].
In terms of intrinsic motivation, self-determination theory represents an important area of research. It explains that every person has three basic psychological needs that must be met in order to acquire intrinsic motivation. These are the need for competence, the need for self-determination and the need for social relatedness. Thus, persons strives to develop a certain level of competence so that they can act successfully and skillfully. However, it is especially important that the person experiences a sense of self-determination and does not feel pressure from outside. The need to form trusting relationships with people also creates the possibility of discovering new interests. For example, an activity can become a hobby because it is practiced by a friend. This can also boost intrinsic motivation if, for example, doing the activity makes it possible to meet up with friends. If certain situations and activities promote the emergence of intrinsic motivation and take over the satisfaction of the three basic needs, it can also be assumed that they are beneficial for mental health. Through the feeling of self-determination, competence and the resulting positive experience values, an activity can also be performed exclusively through the impact of intrinsic motivation without the influence of external extrinsic motivation [11].

Nevertheless, the interest of a learner in relation to a material to be learned shouldn't be disregarded. The presence of interest in a particular area is a major factor in developing intrinsic learning motivation [11].

A term that must also be mentioned in this context is the so-called "flow", which originated from the flow theory [12]. When people are in "flow", they experience a world where actions and consciousness are connected, and there is a sense of control and self-forgetfulness. The feeling of "flow" and the needs for competence and autonomy described in self-determination theory are key factors for people to engage in activities based on intrinsic motivation [11].

Game elements

When using gamification in education, the game elements used should primarily boost motivation. Over time, a list of ten elements has evolved that make up a good game [13]. It is referred to as the "Ten Ingredients for Good Games", which is described in [14].

1. Self-Representation with Avatars

When players can represent themselves in a digital game through an avatar, which they can also design in some way, it changes the way the game is used. The user thus becomes part of the game [14]. This addresses the need for self-determination. The choice of how the avatar should look increases intrinsic motivation [13].

2. Three-Dimensional Environments

By presenting games in a three-dimensional world, users are given an environment that can be understood in a similar way to the real world. This is an important ingredient for a good game [14].

3. Narrative Context

A good story is an essential part of a game. The activities and actions players have to perform are built on these narratives. Rewards are given for the fulfillment of such tasks. Furthermore, information about characters that are part of the game's story is constantly revealed, thus achieving a continuous reinforcement of it. Stories create psychological incentives to increase people's engagement [14].

4. Feedback

Feedback can be given permanently via the game interface. Players get an overview of their progress and can assess how successful they are in terms of the game. Things like progress bars, statistical numbers and much more can be used for feedback. The ability to provide continuous feedback rise player's commitment [14].

5. Reputation, Ranks and Levels

Rankings, levels and reputation allow players to express their competencies. Players often have the goal of increasing their reputation and moving up in the rankings [14]. To be better than other players or to surpass one's own performance can be important factors for increasing extrinsic as well as intrinsic motivation [13, 11].

6. Marketplaces and Economies

Most multiplayer games include some kind of virtual money. With it, one can trade or buy certain things in the store. This can create a virtual economy and its behavior very similar to real life [14].

7. Competition Under Rules Are Explicit and Enforced

Many players want to win. There is a competitive urge that they want to satisfy. Rules play an important role in this context. They determine how games work. However, they don't have to be known right at the beginning of a game, they can also be discovered over time, which can be a lot of fun. In this way, players can ignore rules "without punishment" and try things out or explore them, which is not so easy to do in reality. The rules provide fairness, which give player's a sense of confidence in the game [14].

8. Teams

Games that rely heavily on multiplayer functions and enable or require team play are becoming more and more popular. Thus, people can communicate and interact almost equally as in reality. Players exchange information, tell each other personal things and share experiences. In the meantime, the team tries to achieve goals and solve the tasks going along with them. Thus, the social-emotional level of the players is permanently addressed [14].

9. Parallel Communication Systems That Can Be Easily Reconfigured

Engagement on the social level takes place mainly through communication. How people communicate with each other depends on the task and the players themselves. The ability to communicate increases the fun that players experience [14].

10. Time Pressure

Achieving goals with some uncertainty is an important feature of successful games. On the one hand, the uncertainty arises from the player's skills: "Do I have the necessary skills to complete the task?". On the other hand, it is the time pressure: "Can I complete the task before the time runs out?". A certain uncertainty makes the players enjoy the game. They like to look at the clock [14].

These ten elements are often combined in different ways within games. Some of them are better suited for traditional games, others for digital games [13].

Chapter 4

4. Related research works and studies

To get a basic overview of the current research on game-based learning in the context of second language acquisition, the study by Osman and Rabu [1] is a good starting point. They analyze relevant papers in this research area published between 2008 and 2018. To be included in the study, the articles had to meet specific criteria, such as that a digital game was implemented, it had to be used in the area of second language acquisition and it had to be specified whether the game belongs to the area of CALL or MALL. Finally, 19 papers were analyzed, which are listed in Figure 4.1.

Year	Author	Location	Journal	Participants	Types of Game	Implementation Platform	Target Outcome
2008	Ranalli, J.	USA	Computer Assisted Language Learning	Tertiary Education	COTS	CALL	Language Literacy Skills
2009	McGraw, I., Yoshimoto, B., & Seneff, S.	Taiwan	Speech Communication	Tertiary Education	EDUGAME	CALL	Language Literacy Skills
2009	Neville, D. O., Shelton, B. E., & McInnis, B.	USA	Computer Assisted Language Learning	Tertiary Education	EDUGAME	CALL	Combined Outcome
2010	Liu, T. Y., & Chu, Y. L.	Taiwan	Computer and Education	Secondary School	EDUGAME	MALL	Combined Outcome
2011	Holden, C. L., & Sykes, J. M.	USA	International Journal of Game-based Learning	Tertiary Education	EDUGAME	MALL	Learning Attitude
2011	Aghlara, L., & Hadidi, N.	Iran	Procedia - Social and Behavioral Sciences	Primary School	EDUGAME	CALL	Language Literacy Skills
2012	Rama, P. S., Black, R. W., van Es, E., & Warschauer, M.	USA	ReCall	Tertiary Education	COTS	CALL	Learning Attitude
2013	Berns, A., Gonzalez-Pardo, A., & Camacho, D.	Spain	Computer and Education	Tertiary Education	EDUGAME	CALL	Combined Outcome
2013	Chen, H. J. H., & Yang, T. Y. C.	Taiwan	Interactive Learning Environment	Tertiary Education	COTS	CALL	Learning Attitude
2013	De Grove, F., Van Looy, J., & Mechant, P.	Belgium	International Journal of Language Learning	Tertiary Education	COMBINED	CALL	Learning Attitude
2014	Chik, A.	Taiwan	Language Learning And Technology	Tertiary Education	COTS	CALL	Learning Attitude
2014	Wu, C. J., Chen, G. D., & Huang, C. W	Taiwan	Educational Technology Research and Development	Secondary School	EDUGAME	CALL	Combined Outcome
2015	Reinders, H., & Wattana, S.	Thailand	ReCall	Tertiary Education	COTS	CALL	Learning Attitude
2015	Perry, B.	Canada	Procedia - Social and Behavioral Sciences	Tertiary Education	EDUGAME	MALL	Learning Attitude
2015	Lin, H.	Taiwan	Procedia - Social and Behavioral Sciences	Tertiary Education	EDUGAME	CALL	Language Literacy Skills
2016	Hwang, W. Y., Shih, T. K., Ma, Z. H., Shadiev, R., & Chen, S. Y.	Taiwan	Computer Assisted Language Learning	Secondary School	EDUGAME	MALL	Combined Outcome
2016	Alyaz, Y., & Genc, Z. S.	Turkey	Turkish Online Journal of Distance Education	Adult Learner	EDUGAME	CALL	Combined Outcome
2017	Ebrahimzadeh, M.	Iran	English Language Teaching	Secondary School	COTS	CALL	Language Literacy Skills
2017	Berns, A., Isla-Montes, J. L., Palomo-Duarte, M., & Dodero, J. M.	Spain	SpringerPlus	Tertiary Education	EDUGAME	MALL	Learning Attitude

Figure 4.1.: List of papers analyzed by Osman and Rabu [1, p. 62].

Looking at the number of papers per country published on the topic of game-based learning in the context of second language acquisition, Taiwan stands out with six out of 19 papers. This can be attributed to the fact that the government wants to specify English as the formal second language. The considered participants in the studies are mostly students or pupils of higher institutions of education. Only one study each dealt with adults and primary school students. Although the era of CALL seems to have expired, most studies used digital games, which can be accessed exclusively on a computer. Regarding the areas that studies examined in relation to learning through educational games, Osman and Rabu [1] distinguish between two types of outcomes. First, eight out of 19 studies set the goal of examining participants' learning attitudes in relation to the learning game. This means that things like motivation, fun, engagement and confidence were analyzed in more detail.

The other area that only five of 19 studies examined is called language literacy. Things like reading, speaking, writing skills, vocabulary acquisition, language retention and listening ability are included in this area. The remaining six studies explored a mix of these two domains.

However, there is one notable limitation to this study that should not remain undiscussed. Since the search for relevant research papers was accomplished by means of Mendeley, a software that allows the administration and distribution of research papers, it is possible that important papers related to the treated topic were not considered. According to Osman and Rabu [1], further review papers should consider multiple sources and extend the observation period.

Another review paper by Boudadi and Gutiérrez-Colón [8] also analyzes research in second language acquisition. However, their main focus is primarily in the context of higher education. They posed three research questions, which they answered in the course of their study. The first step was to identify what work has been published recently that addresses how engagement and motivation are affected by gamification in relation to learners in the context of second language acquisition (Q1). The second question focused on published literature that addresses how learning performance in second language acquisition is affected by gamification (Q2). The last question to be answered was whether the literature can also demonstrate through significant results that gamification has positive effects on engagement, motivation and learning success in the context of second language acquisition (Q3). The selection of papers was achieved using Rickson and May's review process [15], which consists of six stages. This was to ensure that clear results could be presented. Finally, 15 papers were selected which were evaluated and analyzed in more detail to answer the research questions (Q1, Q2, Q3).

In all the investigated studies, experiments were conducted with learning tools used for second language acquisition. In five studies a learning game was programmed, while three studies each used the existing applications Kahoot and Duolingo. The predominant second language was English, which was examined in most of the studies considered. Other investigated languages were German, Spanish, French and Italian. Behavioral aspects exclusively at the psychological level, such as engagement and motivation, were analyzed in six studies. Another five papers additionally examined the consequences on cognitive abilities. The experiments of the remaining four studies were limited to cognitive effects only [8].

French students who used a self-programmed learning game (Explorez) showed a strong increase in motivation, which was achieved through the use of gamification elements [16, 8]. The use of Duolingo in an English course for language level A1 showed an improvement in terms of listening ability. In addition, students found it positive to use Duolingo as a learning aid [17, 8]. The use of a self-programmed learning application to improve the conjugation of verbs in Spanish also produced positive results. By learning through the application, students improved their conjugation skills and increased their self-confidence.

In addition, attitudes regarding gamification were very positive [18, 8]. With the help of the application "Guess it! Guess it!", it was able to improve the vocabulary of the participants in a German course for the language level A1 [19, 8]. The use of a digital learning game (Wordbricks) also improved the grammar skills of participants in an English course [20, 8].

Three of the papers could not provide a clear result. For example, the use of Duolingo was accepted for an A1 language level but rejected for a B2 language level because the application was considered too limited [21, 8]. Another study showed that the use of Kahoot in an English course resulted in fewer language mistakes but did not increase participants' self-reflection on those mistakes [22, 8].

Only one study failed to achieve a positive result. The use of an educational game in a French course could not detect any significant result between the experimental group and the control group in terms of fluency and comprehensibility [23, 8].

Regarding the analyzed studies, the authors point out some limitations. Quantitative research methods are prominent in almost 70 % of all the papers studied, where no control groups were used to compare the results. In the studies that took such an approach, in 54 % of the cases the observation period was shorter than one month, 23 % focused on studying participant groups of small size [8].
Because only 15 articles met Boudadi and Gutiérrez-Colón's [8] selection criteria for providing empirical evidence that gamification leads to pedagogically positive effects in the context of second language acquisition, they argue that further research in this area is needed. However, if one only considers the results of the studies, then one would come to the conclusion that gamification has positive effects for second language learners. Nevertheless, due to the limitations mentioned, one should still be careful and wait for further research results in this area, the authors say.

Arce and Valdivia [2] believe that current teaching methods in the context of language learning need to be revised and evolve more towards the digital age. Today's students, who have already grown up in a world where Internet and smartphones are ubiquitous, are often referred to as digital natives. They need education that is more oriented towards modern than traditional methods. For this reason, they developed a digital tool as part of their study, which was used in an English course offered by the National University of Saint Augustine's Language Center. The 114 participants, aged 16 to 35 years, were divided into two experimental groups and two control groups. The instructor, who remained the same in all four groups, taught the same material throughout, but the digital learning tool was used in the two experimental groups and a traditional English book in the control groups. The duration of the study was about two weeks. Per group, ten hours were taught in this setting. Learning success was measured by comparing two tests, one taken before and one after the two weeks of instruction.

The developed tool includes among others the following functionalities, which Arce and

Valdivia [2] divide by means of the MDA framework [24] into mechanics, dynamics and aesthetics:

Mechanics: Under this point, all operations that a user can execute within the game are summarized and form the basis of implementing the dynamics. The application has various activities that players can perform, such as matching pictures to the appropriate words, completing words, or translation of sentences. Users can determine their progress in the game by leveling up, ranking lists, or even by the medals they receive. The tool also has different difficulty levels. In addition, a background story is told and the possibility for hints and tutorials is provided [2].

Dynamics: Describes how a user can execute the described activities (mechanics). The navigation takes place via a virtual classroom, which is displayed in 3D. By interacting with objects in this space, the player can start different mini-games, adjust the difficulty levels or view the medals received [2].

Aesthetics: Expresses the player's reaction on an emotional level. It's about the presentation of the game. In this context, the educational game is presented in 3D format, in which it is possible to act with all the provided objects [2].

To master a language sufficiently well, four skills must be learned: Speaking, writing, reading and listening. Exactly these areas are specifically trained with the learning game and checked by means of the tests carried out [2]. The results are shown in Figure 4.2.

Significant learning differences were found between the experimental groups and the control groups in both writing and listening skills. For both skills, the experimental groups achieved significantly better learning results through the use of the learning game than the students who were taught using traditional teaching methods. On the one hand, writing skills were trained through the increased use of grammar exercises and on the other hand listening skills were trained through audio recordings, which were used by the students to familiarize themselves with the language. For the skill of speaking, the experimental groups record a learning success, but this does not differ significantly from the learning success in the control groups. This is attributed to the fact that the learning tool only supports a few functionalities to train this skill specifically. The results in terms of reading ability also show significant differences between the experimental and control groups. A strong learning success was achieved in the experimental groups [2].

Questionnaires were used to determine how students perceived learning in their groups. For example, about 83 % of all participants in the experimental groups said that they were encouraged to study English. In the control groups, only about 37.5 % were motivated to learn the language. In addition, the experimental groups were asked how much they liked using the educational game and the control groups how much they liked using the book. In the experimental groups, 81 % of all participants enjoyed using the educational game,

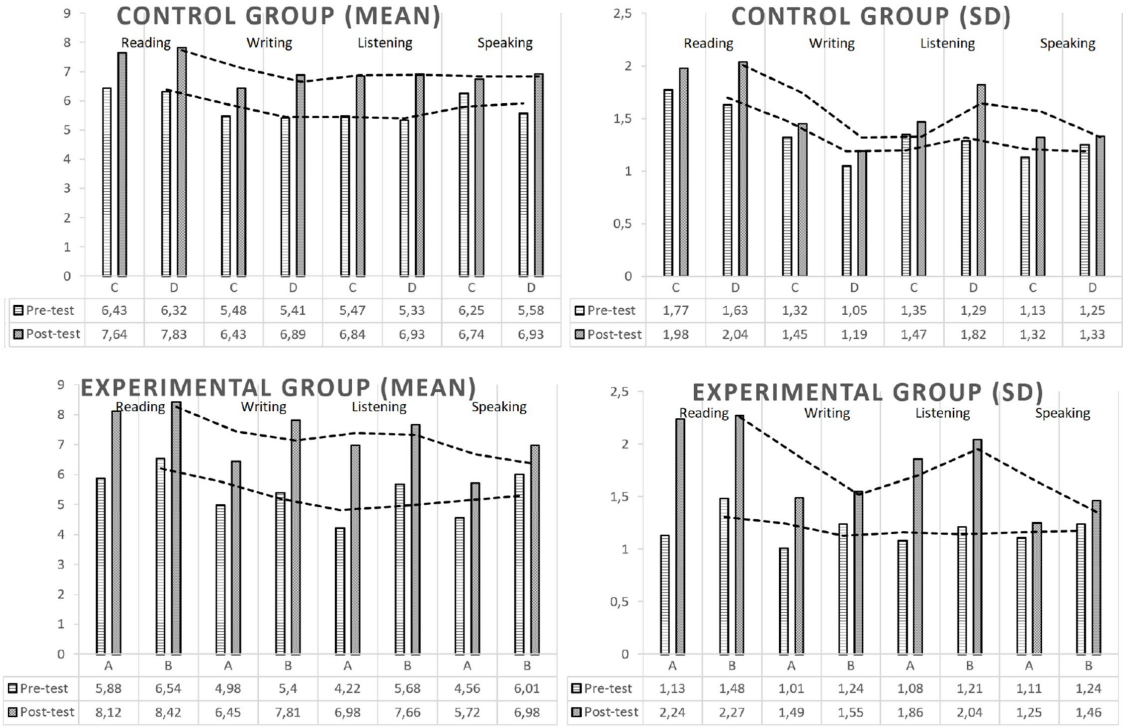


Figure 4.2.: Results of the study conducted by Arce and Valdivia [2, p. 201 f.]

while in the control groups, only half of the participants liked to use the book for learning [2].

Arce and Valdivia [2] show that students experience more motivation and engagement in learning when using a digital learning game. In addition, they are much more engaged in the classroom, even those who normally do not necessarily show strong participation. By providing functionality that allows them to compete with others, it creates a sense of competition that motivates students to try to outperform each other. As shown in Figure 4.2, an educational game can not only increase motivation and engagement, but also have a positive effect on learning outcomes. Thus, modern digital learning resources are effective in terms of their use as teaching support tools.

The study of Pereira, Morton and Gomes [13] is an innovative approach and examines the motivation of students in interaction with their learning styles. They use the Index of Learning Styles framework [25], which categorizes the many different learning styles into four dimensions. These are the dimensions “sensing-intuitive”, “visual-verbal”, “active-reflective” and “sequential-global”. By analyzing the collected data (evaluating game data such as number of medals received, number of duels played, ranking placement, etc., as well as interviews conducted), they were able to identify three so-called “motivational learning modes”. Students can be assigned to these modes according to their learning style and the motivation associated with it. They distinguish between the types “Learners”, “Gamers”

and "Hybrids".

Learners: All students belonging to this type stated that they mainly played the game because they wanted to acquire more knowledge about the topic covered by the application (strategic management). The goal of the learners is to advance in the level as fast as possible in order to unlock new questions and thus quickly acquire new knowledge. These are also the students who show a particularly strong intrinsic motivation in relation to the game. Game elements, such as the possibility to compete with other players in duels, climb up the rankings or earn medals were not used by this type of players or were deliberately ignored. They loved the possibility of instant feedback and repeating wrongly answered questions. These types of students can most likely be attributed to the "sensing" and "reflective" learning styles. They prefer to learn by traditional methods and preferably without being distracted [13]

Gamers: Students who are referred to as gamers are players who are motivated by game elements such as badges, leaderboards and the ability to play against other players. They want to satisfy their competitive drive and are the ones who encourage other people to play the game. Nevertheless, exactly these kinds of game elements a gamers loves can also make them stop playing. Namely, exactly when the gap to the top in the ranking is too big and they have decided for themselves that they can't win anymore. As a result, the engagement to continue playing is lost. In terms of learning styles, they can best be categorized as "intuitive" and "active" learners. Gamers don't want to learn through traditional routine methods like repetition, but through activities that are innovative. They also prefer to be able to play with other people, such as classmates [13]

Hybrids: They represent a mix of learners and gamers. In the long term, they are motivated by the learning goal they are pursuing, leading to the development of intrinsic motivation. Extrinsic motivation is increased, for example, through rankings or the acquisition of badges and causes that hybrids are motivated while playing. Hybrids therefore play for the longest time of all three player types. They can best be assigned to the "visual-verbal" learning style. This is because, on the one hand, they use verbal learning activities such as learning by answering questions and on the other hand, they perceive visual methods such as getting badges and looking at the leaderboard as motivation [13]

One study which has examined how the combination of different game elements satisfies basic psychological needs such as autonomy, competence and social relatedness is included in the paper by Sailer, Hense, Mayr and Mandl [7].

It is assumed that the perception of competence can be conveyed by means of game elements that fulfill a feedback function. These include elements such as rankings, badges or points. Graphics and statistics are also important elements in this context, as they allow the players to see their performance over time.
Regarding autonomy, two types are differentiated. On the one hand, it is about conveying

to a person that the task to be performed is meaningful (task meaningfulness). On the other hand, users should have the feeling that they can decide freely with regard to the game (freedom of choice). It is expected that the first need can be achieved with a good story, in which the player must perform certain actions. This makes the user perceive them as meaningful. In terms of freedom of choice, the integration of avatars plays an important role. For example, if characters can be designed or freely chosen, it is assumed that this has positive effects in terms of fulfilling this need.
Concerning social relatedness, it is also assumed that the use of stories is beneficial. When users take on an important role in the story and may have to work together with other players, real players or NPCs (non-player characters), to progress, they feel important [7].

To test these assumptions, a game was developed to simulate the process of taking goods from a warehouse based on the fulfillment of orders in a gamified manner. Three groups were formed, in which different game elements were activated. The control group, consisted of 150 participants, only received points for completing tasks during the game. Experimental group one, consisted of 103 people, had additional game elements available. In addition to earning points, players could also receive badges and move up in a ranking list. Also graphics, such as bar graphs were enabled, which allowed players to view the completed jobs in a clear form and track their score. Experimental group two was composed of 78 participants. In addition to points, players were allowed to choose an avatar when starting the game. A story was told about why it is necessary to complete the orders. The orders were supplies for an aid mission. Moreover, NPCs moved around in the warehouse [7].

To check the satisfaction of the needs, the participants of all groups had to complete a questionnaire at the end of the study. For each type of need, three to four questions were asked, where the participants indicated on a seven-point scale the extent to which they agreed or disagreed with the statement. The evaluation shows that the feeling of competence in experimental group one was significantly higher than in the control group. Regarding freedom of choice, no significantly higher satisfaction was found in experimental group two compared to the other groups. The meaningfulness of tasks was best conveyed in experimental group one. No significant differences were found between experimental group two, used the game with a background strory, NPCs and avatars, and the control group. Thus, this need was not best satisfied by game elements such as stories and teammates, but by points, badges and rankings. As already assumed above, the demand for social relatedness was best satisfied by experimental group two. Significant differences were found between this and the other two groups with regard to this need [7].

Sailer, Hense, Mayr and Mandl [7] demonstrates that certain needs can be satisfied through the targeted use of the right game elements. Gamification can therefore increase motivation and engagement in certain areas, such as education or the work environment. However, the games must be sufficiently well designed and the used gamification elements must also have a certain quality and aesthetics to be effective.

When reviewing the papers, it is noticeable that there are many research directions in this application area. There are works such as the one by Arce and Valdivia [2], which not only examine a learning game regarding its effect on motivation, but also whether the language skills of the participants are improved. They were able to confirm that both motivation and language skills are enhanced. Sailer, Hense, Mayr and Mandl [7], on the other hand, investigated how combinations of different game elements can satisfy the needs for competence, self-determination and social relatedness, which are important for the emergence of intrinsic motivation. It should be noted that this study was not conducted in the context of language learning.

The works of Osman, Rabu [1] and Boudadi, Gutiérrez-Colón [8] are so-called review papers, which analyze several studies regarding a topic, in this context language learning with digital application and summarize their results. The authors of such papers define inclusion criteria for the studies and works they will include in their paper.

Boudadi and Gutiérrez-Colón [8] show that more research is needed in the context of second language acquisition through digital learning games, as only 15 works could be included in their paper which met their inclusion criteria. However, both show that most of the studies dealt with students or pupils of higher educational institutions. Only a few examine primary school or middle school students as their target group. Less common are studies that focus on children who are refugees in a country and therefore need to learn the language of the country of immigration in order to integrate into society. This is exactly the goal of the study in this thesis, which aims to investigate how a language learning app with integrated game elements affects the motivation of such students.

Regarding research question RQ2, the related works show how diverse the approaches in literature are regarding the topic of digital learning games in the context of language learning and education in general. Research on digital educational games in various application domains has increased enormously in recent years and will continue to do so. Because digital learning games become more and more attractive as learning aids in schools, more research in this area will be needed in the future to clarify how digital learning games can increase student motivation and how educational apps need to be structured to ensure good learning outcomes.

Chapter 5

5. Lernen&Spielen - The digital game

In every project, the planning phase is crucial. Points that are forgotten or not sufficiently considered in this stage of the project can only be made up with difficulty and a certain amount of time in a later phase of the development. Before the actual implementation, the following requirements for the application were defined during such a planning phase:

- The application should be available online.
- Users should be able to create a personal account.
- The progress of logged-in users should be persistently stored in a database.
- Registered users should be able to create new game content, which must be saved persistently.
- Users without an account should still be able to use certain game content for learning.

As can be seen from the defined requirements, the application needs a permanent internet connection. This is an essential requirement, as people without internet access cannot use the application. It is assumed that in today's society, where almost everyone owns a smartphone, even students in primary school already own mobile phones with internet access. If this is not the case, parents' smartphones or computers provided by the schools can be used. In addition, a permanent internet connection enables and facilitates the storage and evaluation of users' game data. Gamification elements, which are discussed in more detail in section 5.3, can also be implemented and used more effectively. Besides the requirements specified above, optional requirements were defined, which were finally also integrated into the application:

- **Experience points (EXP or XP)**, that logged-in users receive when playing and which enable them to level up.
- **Avatars** that represent the users in the game and which can be customised.
- **In-game money** that users earn during the game.
- A **shop** where users can buy new items for their avatars using the in-game money they have earned.

Once the requirements for the application were known and defined, the appropriate technologies for the implementation had to be found. The following lists the technologies used and describes why they are used in the project.

Firebase

Firebase [26] is a platform supported by Google that helps developers to create apps. There are a number of services that can be integrated into custom applications through the Software Development Kit (SDK). For example, data can be stored in the so-called Firebase Realtime Database. The complete user administration can be handled via Firebase-Authentication. In this project, Firebase is used as a hosting platform. This means that Firebase manages and executes the deployment of the application. In addition, the registration and login of users is handled using Firebase-Authentication. Data is stored using the Firebase Realtime Database, which is a NoSQL cloud database. The information is stored in JSON format and synchronized with all clients in real time. The avatar items are stored using Firebase Storage. For further analysis of the learners' behavior within the game, Firebase Analytics is integrated into the application, making it possible to track specific user interactions.

React

React [27] is a JavaScript-based library that enables the creation of user interfaces (UIs). The development of an application is done by implementing several individual so-called React components, which are then finally combined to form an application. Further, React relies on the use of a virtual DOM (Document Object Model), which ensures that the UI represents the current state of the application. Changes in the virtual DOM are then propagated to the "real" DOM. In this way, modifications to the user interface of dynamic web pages can be made in a very short time. In addition, the implementation of React components is done using JSX (Javascript Syntax Extension). It extends the classic JavaScript by the possibility to use HTML (Hypertext Markup Language) elements directly in the JavaScript code. Thus, logic and layout are no longer separated, but elegantly connected [28]. In the project, React is used to program the educational game.

React Bootstrap

React Bootstrap [29] is a front-end framework and provides already implemented components, such as buttons or forms. Pre-implemented elements of Bootstrap can be used and extended with the desired functionalities. These components are already well designed so that CSS (Cascading Style Sheets) only needs to be used to a limited extent. Pre-implemented components such as buttons, forms, navbar, modals, etc. are used in the project.

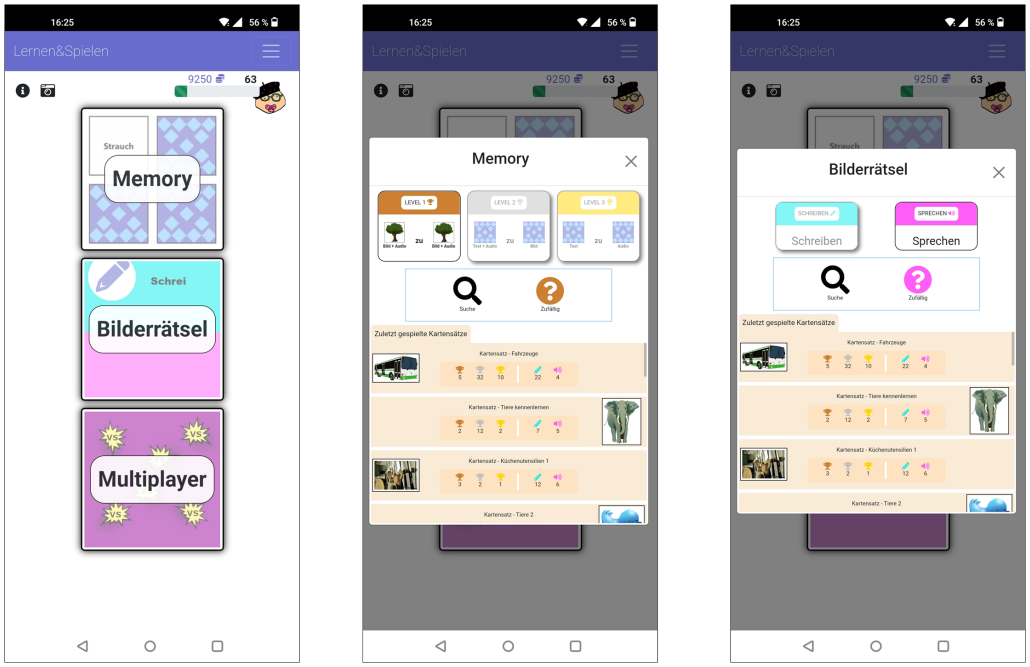
The "Lernen&Spielen" application is developed as a Progressive Web Application (PWA). This means that the application is accessed via a URL (Uniform Resource Locator) in the browser. This has the advantage that the learning game can be retrieved and used on almost any device with internet capability. By using CSS, the display can be optimized for a wide variety of devices (computers, smartphones, tablets, etc.). A costly "multi-development", for computers, Android, iOS etc. is omitted [30]. However, care must be taken during implementation to ensure that users can use different browsers for access. For example,

a Google Chrome browser supports different functionalities and services than Mozilla's Firefox. The application must be able to run on a wide range of web browsers without any restrictions. Furthermore, the application communicates with the learners by means of speech output. When the pop-up windows (b) and (c), shown in Figure 5.1, are opened, the user is informed about the absolutely required and additionally possible settings. This facilitates usability by supporting users during the interaction with the learning game. The Web Speech API [31] is used for both speech output and speech input.

The following sections of chapter 5 discuss the implementation of the learning application in more detail. Individual screens of the application are shown for better illustration. The snapshots were taken from a OnePlus 9 Pro smartphone.

5.1. Language learning using the application

The learning game is used in the course of German as a second language instruction and is intended to promote the motivation of the students to learn German. The available game types "Memory" and "Bilderrätsel" are designed to train all four skills that must be mastered so that a language can be used meaningfully. These skills are speaking, writing, reading and listening [2].



(a) (b) (c)

Figure 5.1.: (a) Game overview screen, (b) "Memory" game settings and (c) "Bilderrätsel" game settings.

However, the application is limited to exercises using individual words and terms. The learning game can be seen as an improved vocabulary trainer, with which the meaning of new terms can be learned and their pronunciations and spellings can be specifically trained.

Figure 5.1 shows three screens. The game overview screen (a) has a simple structure. Three image buttons represent the playable game content. Background images in GIF format are used to make the view more dynamic and exciting. Navigation is intuitive by pressing these buttons. With this, simple operation via smartphones is ensured. Pressing the "Memory" or "Bilderrätsel" buttons opens the windows shown in the screen (b) and (c). Via these panels, the game settings for the selected game mode can be configured. This includes selecting a level or game variant and a card set. The creation of card sets is discussed in more detail in section 5.2.

5.1.1. Memory

This game mode is basically similar to a classic memory game. The player has to find matching pairs of cards until all cards could be put aside. In this context of second language acquisition, a pair of cards defines a German term. There are three different levels to choose from, which differ in how the term is represented on the cards (see Figure 5.2):

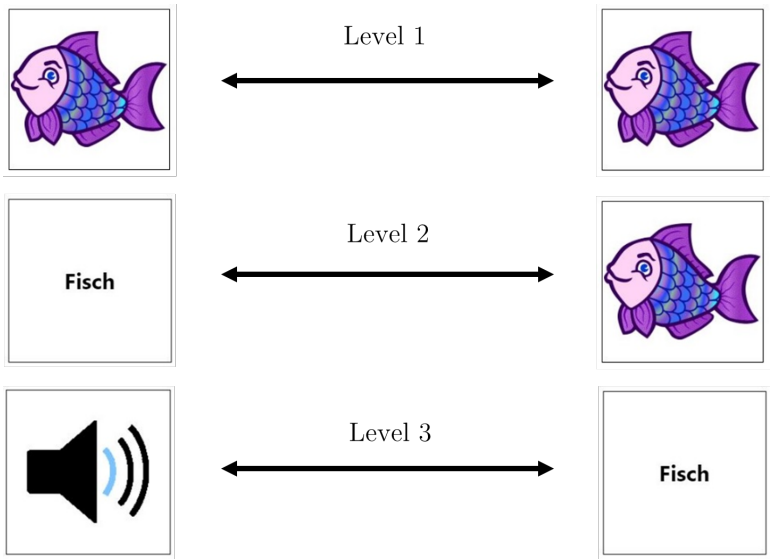


Figure 5.2.: Representation of the term "Fisch" as card pair for level 1, level 2 and level 3 of the memory game mode.

- **Level 1:** At the beginning it is about getting to know terms and understanding their meaning. Therefore, both cards of a pair show the same picture and the terms are

played back acoustically by the application. The spelling of the word is in this level not considered.

- **Level 2:** In this level, the spelling of the term is also taken into account. One card shows the term in written form, at the same time the term of this card is played back acoustically by the application. The matching partner card again shows the picture.
- **Level 3:** The third and most difficult level requires that the person is already familiar with the spelling and pronunciation of the term. No more pictures are shown. Instead, one card only displays the word in written form, while the other card only presents the term in acoustic form.

The different levels are designed to slowly increase the difficulty of learning. In addition, an attempt is made to address different types of learners equally. Figure 5.3 shows the flow of a memory game. First, all cards of the selected card set are initialised, shuffled and displayed with the back facing up. When the user touches one of the cards, this card will be turned. The goal is to find all pairs of cards, complete the card set and receive a corresponding trophy for the selected level (level 2 in this example).

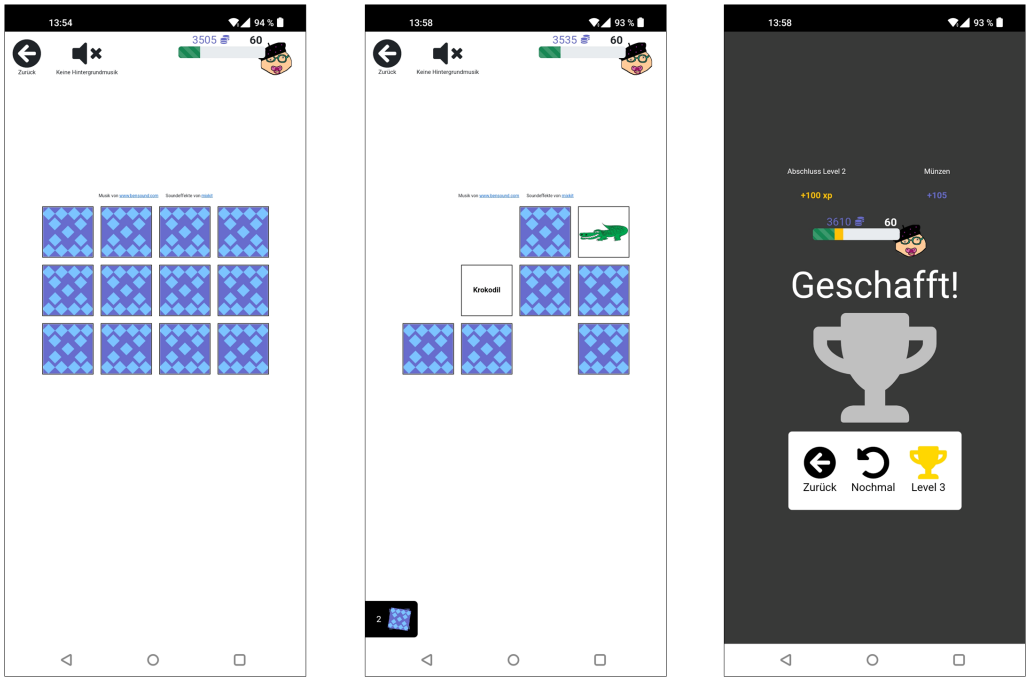


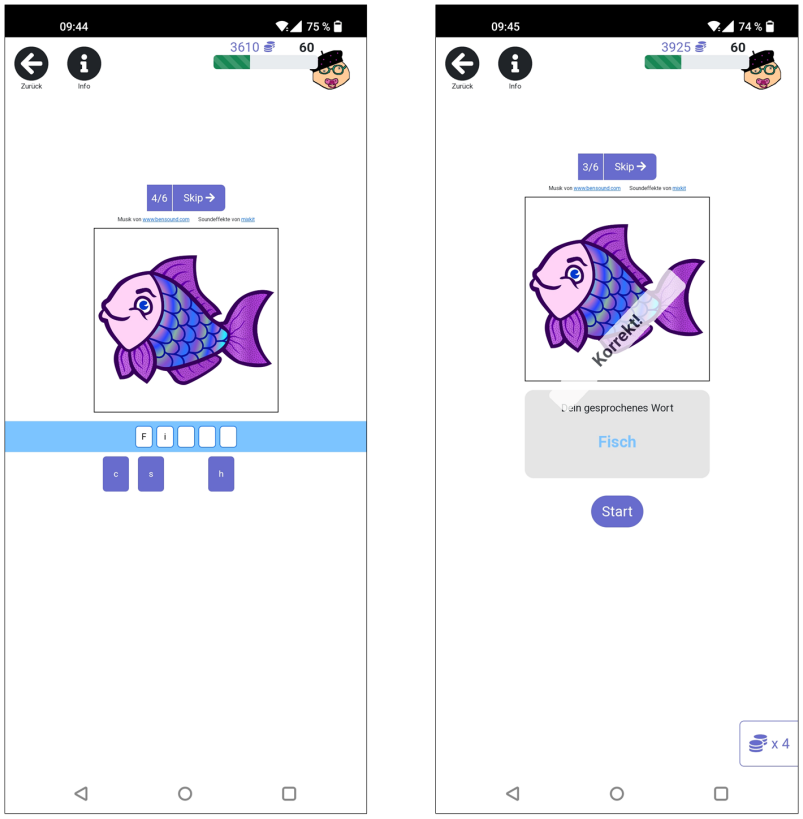
Figure 5.3.: Flow of a memory game.

5.1.2. Bilderrätsel

When playing the game type “Bilderrätesel”, a learner can choose between two game modes. The spelling of German words can be specifically practiced in the mode “Schreiben” (write).

The term represented by a picture should be written correctly by putting the letters, which are displayed in random order, in the correct sequence (see Figure 5.4 (a)). The game mode "Sprechen" (speak) is available for practicing the pronunciation of terms. Here, the term represented by a picture should be spoken correctly. The user presses the "Start" button, which causes the application to wait for a voice input (see Figure 5.4 (b)). If the word is spoken correctly by the user and is also recognized right by the application, the program automatically continues with the next term.

The "Skip" button is used to omit terms, if they are not known. As can be seen in Figure 5.4 (a) help can also be accessed via the "Info" button. Among other things, the functionality of the "Skip" button is explained and tips for playing are given. More about guides in section 5.3.6.



(a) (b)

Figure 5.4.: Screens of the game modes "Schreiben" (a) and "Sprechen" (b).

5.2. Creation of new game content

All available games and thus the learning of German words works via so-called card sets. It is important not to use a fixed set of terms to make the game content expandable. All users who have an account are able to create new cards and card sets, which can then be played by all learners. This creates a dynamic game content that can be permanently increased. Therefore, even users who play a lot do not get bored. Either other users add card sets or the user himself can lend a hand and create new game content. A good side effect of creating one's own cards or card sets is that the learners are already familiar with the German words at this stage if they want to integrate them into the application. Teachers can also add new words when they create an account. In this way, learning can be specifically limited to certain terms which, for example, are important for the next vocabulary test. How the process of creating new content works will now be described in more detail.

5.2.1. Cards

A card in this context represents a German term. To add a new card to the learning game, a predefined form needs to be filled. (see Figure 5.5 (b)). First, the term itself must be specified, which will be represented by the card. Next, a picture describing the term has to be chosen. Only pictures from the website pixabay [32] can be used. This restriction is based on the following reasons and considerations:

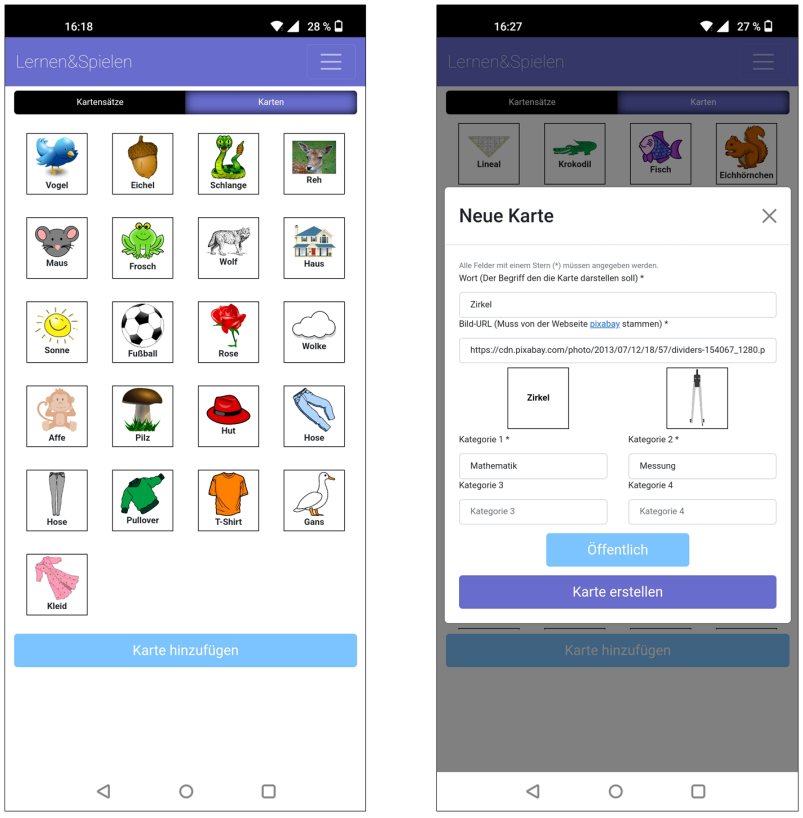
1. All resources originating from this website can be used anywhere without copyright infringement. It is not necessary to indicate the source or to obtain permission for use.

2. Pixabay is a large platform with over 2.6 million resources (as of 25.07.2022). Therefore, it is not necessary to integrate a separate image management system, which would represent an enormous additional expense if implemented efficiently.

3. If users are unable to find a suitable image, they can create their own account on pixabay and upload their own images.

Because the images are only referenced, i.e. only the URL is used, there is no need for cost-intensive storage. It is sufficient to store the URL in a database and retrieve it when required. However, it is possible that the URL may change or become outdated over time. Thus, the users have the possibility to revise their added cards at any time. This also includes the choice of a new representative image. In addition, the same term can be added by several users. This means that there can be several cards describing the same word, but each using a different picture for illustration.

The assignment of categories (min. 2, max. 4) helps to find relevant cards quickly. This is particularly beneficial when creating new card sets, which will be described in more detail in the next section.



(a) (b)

Figure 5.5.: Added cards of the logged-in user (a) and filled form for creating a new term (b).

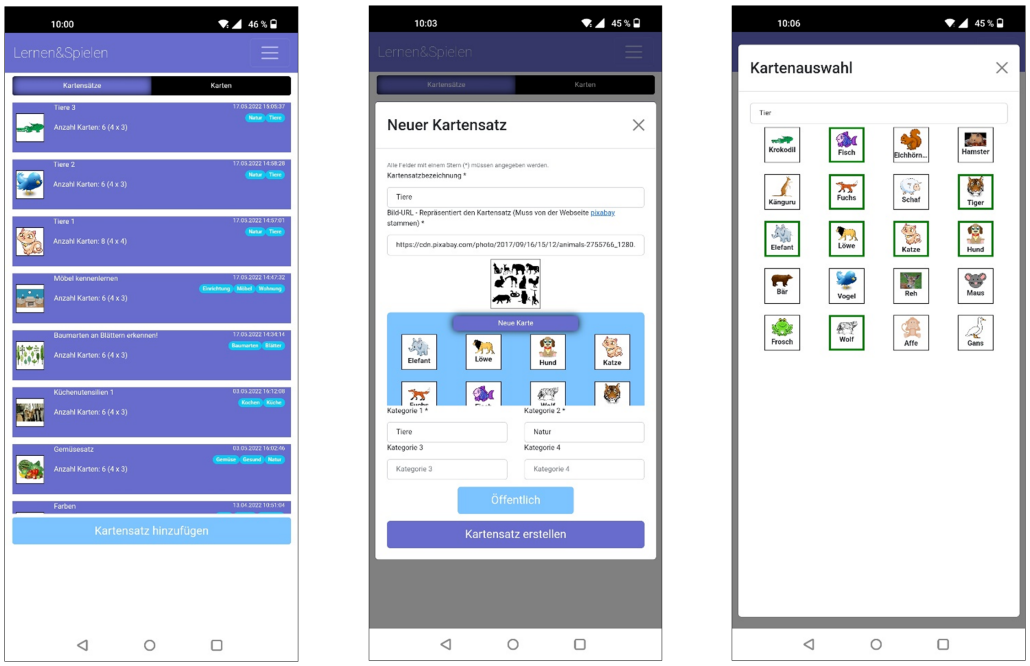
5.2.2. Card sets

Creating a set of cards works in a similar way to adding individual cards. The most important step is to select the cards that will make up the set. The card selection window can be seen in Figure 5.6 (c). Any card of any user that has ever been added can be selected. It is also possible to search for relevant cards to speed up the selection process. It can be searched either directly by the term or by categories, that a user has to specify when creating cards. Figure 5.6 (c) shows a search by category “Tier” to limit the terms only to animals. However, there are the following restrictions when selecting cards:

- A set of cards cannot consist of any number of cards. Either four, six or eight cards must be selected. One reason for this is that the cards can be displayed nicely on a smartphone screen when playing the “Memory” game mode, so that a user does not have to scroll all the time. On the other hand, learners should not have to find 50 pairs of cards before they finish a game and see a success.

- If there are several cards representing the same term, only one of them can be inserted into the card set. This is because otherwise it would not be clear which partner card belongs to which of the two terms.

As already for cards, categories (min. 2, max. 4) must also be specified for card sets in order to make it easier to search for them (see Figure 5.6 (b)).



(a) (b) (c)

Figure 5.6.: Added card sets of the current user (a), form for creating a new card set (b) and the card selection when creating a set of cards (c).

5.3. Integrated gamification elements to increase motiviation

Having outlined the different game modes and described the learning possibilities with the application in more detail, the next step is to look at the elements that have been integrated into the learning game "Lernen&Spielen" in order to increase the motivation of the learners with regard to the tool and thus enhance the students' engagement in language learning.

The list "Ten Ingredients for Good Games" presented in chapter 3 is used as a reference for the selection of appropriate game elements. The following components are considered relevant for the application context and have been integrated into the educational game:

1. **Avatars**
2. **Feedback**
3. **Reputation, Ranks and Levels**
4. **Marketplaces and Economies**
5. **Competition under Rules**
6. **Time Pressure**

(7. **Guides and video tutorials**)

In order to ensure an attractive usability and especially not to overwhelm children during use, the points established by Nielsen in his usability heuristics [33, 34] were taken into account. One point states "Speak the language of the user". This means that appropriate symbols should be used for buttons which are supposed to fulfil a specific purpose. For example, an "X" should symbolise the closing of a window or the cancellation of a process. Another point is called "Feedback of the system". This is about providing the user with information about the current system status. In this context, "feedback" means both error and positive messages. Nielsen defines in total ten points that are indispensable for a user-friendly application.

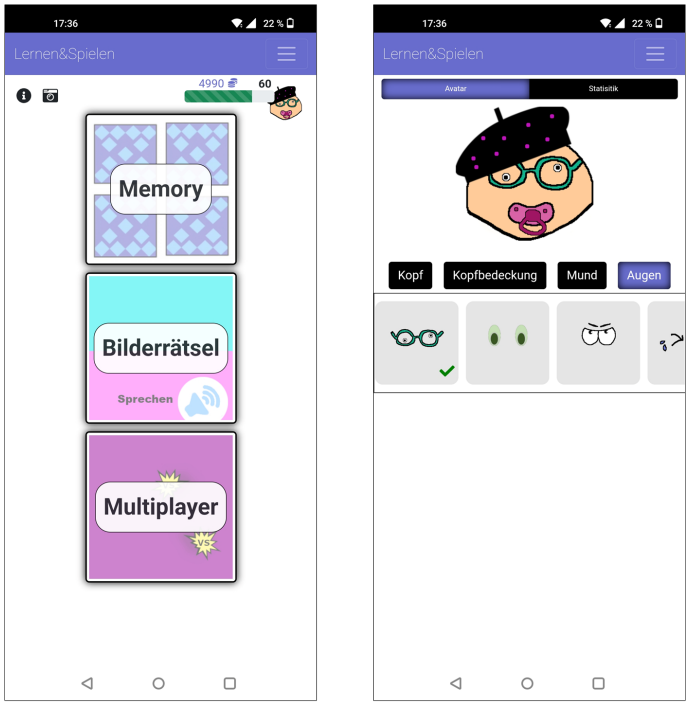
"Documentation and support" is also one of the points defined by Nielsen. He is convinced that every application, no matter how simple it is to understand, needs some kind of "help" in order to be able to look up information in case of inconsistencies [34]. In this work, it is assumed that guides and tutorials not only represent important points for user-friendliness. For this reason "Guides and video tutorials" are also considered as game elements that can increase motivation, even if they are not on the list used as a reference for the selection process. Therefore, point 7 is listed in brackets.

5.3.1. Avatars

Customization is one of all gamification elements that has been least analyzed. With regard to virtual applications, such as software programs or digital games, a differentiation is made between personalization, which is done by the system itself, and customization, which is performed directly by the users. The independent personalization of the system is based on the previous user behavior. A personalization takes place, for example, when surfing the Internet through the used web browser. In customization, users make the changes on their own. In other words, changes are made with regard to the personal interests and preferences. This provides more control over software programs to users and increases their feeling of autonomy [35].

Examining customization in the context of several MMO games, researchers determined that it could occur at three different levels:

- **Functional:** If changes have a direct impact on the dynamics and mechanics of a game, this type of customization is called functional. An example is the selection of different abilities of his character.
- **Cosmetic:** Reshaping the avatar in terms of visual appearance without changing its attributes and abilities falls under the type of cosmetic customization. It does not affect the gameplay. However, it may affect the players' attitude towards the game.
- **Usability:** Through usability customization, users can redesign the user interfaces as they wish. For instance, buttons can be arranged differently or color settings can be changed. This can have an impact on users' gaming experience [36].



(a) (b)

Figure 5.7.: The avatar illustration on the game overview screen (a) and the screen where users can customize their avatars (b).

Customization of an avatar falls under the category of "cosmetic customization". In the "Lernen&Spielen" application, an avatar also represents the players within the game. Figure 5.7 shows the avatar on the game overview page (a) and how players can customize their avatars (b).

As shown in Figure 5.7 (b), an avatar represents a face. This can be reshaped in four areas. First, the head can be customized. Here a user can choose from several different head shapes and skin colors. Furthermore, a headgear can be selected. Headgear includes caps, headphones and hairstyles in a wide variety of designs. The third option of customization takes place at the mouth. In this case, users can choose from a large number of mouth shapes (closed, open, showing teeth, etc.). Instead of a mouth, however, a beard or pacifier (see Figure 5.7) can also be used. Furthermore adjustments can be made to the eyes. Glasses can be put on or one can choose different eye types. Of course, at the beginning of the game not all customization elements are freely available. Players have to exchange their earned coins for new items in the shop (see section 5.3.4).

5.3.2. Feedback

The term "feedback" appears in the literature both in Nielsen's usability heuristics [33, 34] and as gamification element [14]. Nevertheless, the term has a different meaning in these two domains or is interpreted in a different way. Therefore, this thesis distinguishes between two types of "feedback", namely system relevant feedback and game relevant feedback.

System relevant feedback - Nielsen defines the term "feedback" as follows: *"The system should continuously inform the user about what it is doing and how it is interpreting the user's input"* [34, p. 134]. A software program should avoid error situations by providing appropriate feedback at the right point in time. As an example, Nielsen mentions the dialog process that occurs when overwriting files. Bad feedback would be if users were only asked if they really want to replace the file without providing any information such as name or attributes like creation date or type of the file to be overwritten. It would be difficult for users to determine if only an outdated version of the file would be overwritten or not. However, even worse than inappropriate messages is no feedback at all. There are system relevant feedbacks, which only convey general information and disappear by themselves after a certain period of time, but also feedbacks which require a confirmation of the users. Positive feedback through the system is also necessary and promotes usability. Any feedback should be given in clear language and in a well-structured manner [34].

Game relevant feedback - As already described in chapter 3, game relevant feedback can be given using a wide variety of elements via the user interface. Feedback that is given continuously has a positive effect on players' engagement towards a game [14]. There are theories suggesting that elements that provide some sort of feedback related to game progress (leaderboards and points) have an impact on satisfying players' need for competence [37]. Feedback also plays an essential role in the flow theory [12] discussed in chapter 3. Direct feedback and the setting of clear goals make it easier to reach the so-called "flow state" [38].

Figure 5.8 shows feedback of both types. Game relevant feedback includes among other things the overview of the experience points and coins obtained when successfully completing a game. Newly received XP are immediately added to the points collected up to that point

and visualized using a progress bar. This allows users to track their game progress in a clear manner. If a game is successfully completed, additionally a trophy is awarded according to the game mode played (see section 5.1). These trophies are displayed when a card set is selected, so players can see how many times and how successfully they have already played that card set. Also, when a term is correct "recognized", whether in the "Memory" or "Bilderrätsel" game mode, users are signaled that they have found the correct "solution".

System relevant feedback includes, among other elements, error messages during the login process. In case of incorrectly entered data, which cannot be assigned to an account, the message "E-Mail Adresse oder Passwort falsch." is displayed. When compiling a card set and selecting several cards describing the same term, which is not possible because of the reason described in section 5.2, a corresponding notification is shown. The visualization of longer loading processes is also an important system relevant feedback. An example of positive feedback can be seen in Figure 5.7 (b)), where a green checkmark indicates to users that the avatar customization was successful.

In addition to textual and visual feedback, the application also provides audible feedback. When a pair of cards is found correctly, a "bell-like" sound is played to indicate success. If users forget to select one of the game variants "Schreiben" (write) or "Sprechen" (speak) but press the question mark button (?) to play a random set of cards in the mode "Bilderrätsel" (see Figure 5.1 (c)), a suitable information is provided via the integrated Web Speech API telling users that they have to select one of the two game variants before the game can be started.

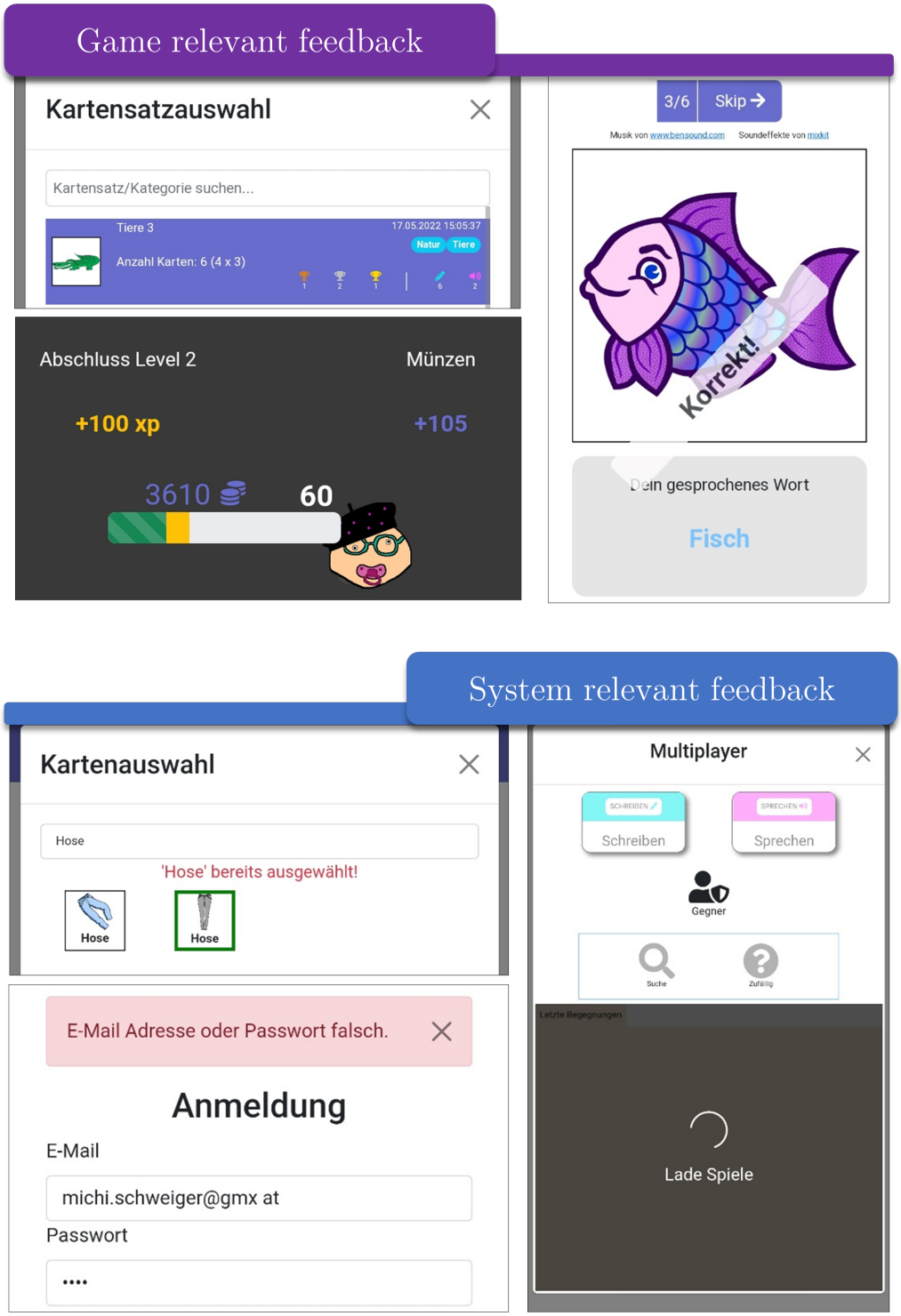


Figure 5.8.: Some examples of system and game relevant feedback of the learning game "Lernen&Spielen".

5.3.3. Points, levels and ranking

Rankings, in the literature also referred to as leaderboards or personal statistics, so-called character sheets, are often used as gamification elements so that users can monitor their progress in the game. Accomplishments made during the game have an impact on the ranking. Entries such as experience points, coins, etc. are constantly updated and are visible to all users. This type of game element allows players to quickly gain information about other players, such as skills, competencies and reputation, in a clear and concise manner [39]. Hence, they can take over the satisfaction of competence and have a positive impact on intrinsic motivation of users, which can lead to an enhancement of performance [40]. According to [41], gamification is already practiced in the education system, more specifically in schools and universities. Students are rewarded with points when they successfully complete tasks. Points are accumulated and exchanged for the awarding of "badges", referred as grades. Students also move up in "levels". When they have achieved enough positive results in a school year or semester, they move up to the next class or can take new courses. However, schools traditionally do not emphasize competition to increase motivation as gamification does.

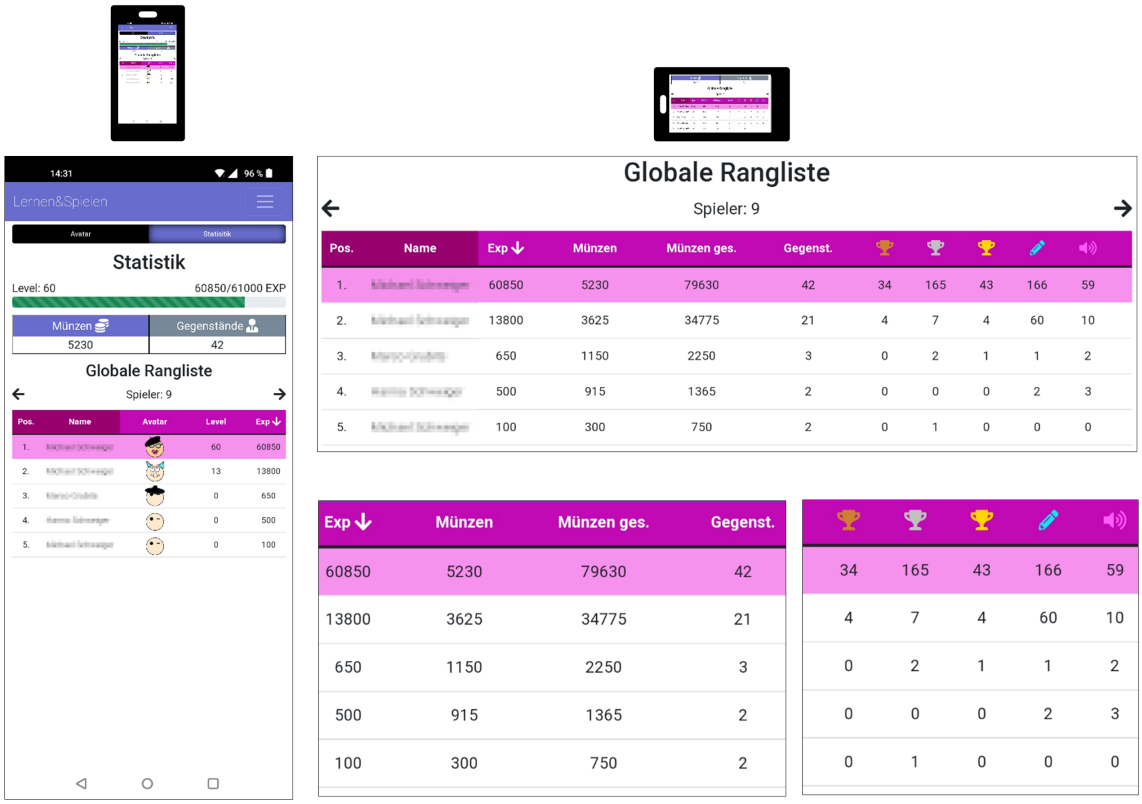


Figure 5.9.: The ranking list of the learning application "Lernen&Spielen".

Systems which focus on competition are used by players to compare oneself with others. It can be motivating when users see their successes recognized publicly [42]. However, as already shown by the study of Pereira, Morton and Gomes [13], discussed in chapter 4, exactly these kinds of elements can also have a demotivating effect. If the gap to the top of the ranking becomes too large, the commitment to continue playing can slowly decrease until players stop playing the game completely because they no longer see a chance to "win".

In Figure 5.9, the global ranking and the so-called character sheet of a user can be seen, which are summarized under the term "Statistik". This screen can be reached by clicking the avatar on the game overview page (see Figure 5.7 (a)). While the character sheet of a player only contains information about the level, current amount of earned coins and already purchased avatar items, the global ranking contains further data, which can be used by the users to compare themselves with each other. Following information can be found in the "Globale Rangliste" which can be seen in Figure 5.9:

- **Pos.:** Represents the position of a player in comparison to all other players.
- **Name:** In this column the names of the users are displayed, so that the game data can be assigned to a specific person, e.g. to enable a systematic comparison between friends.
- **Avatar:** Shows the currently set avatar of a specific user. This can also be used to express some kind of prestige, for example when using avatar items that cost a lot of coins.
- **Level:** The current level of a user.
- **Exp:** The current number of experience points per player.
- **Münzen:** The current number of obtained coins.
- **Münzen ges.:** Are the coins a player has ever owned. This means that the coins that have already been spent on items in the store are also added to the current account balance.
- **Gegenst.:** Is the number of items a user owns at the moment.
- **The five "trophies":** Each of the five trophies represents a game mode and the entry in the respective column represents how many times players have successfully completed a card set in the particular game mode (Bronze trophy - Memory Level 1, Silver trophy - Memory Level 2, Gold trophy - Memory Level 3, Cyan trophy - "Bilderrätsel Schreiben", Purple trophy - "Bilderrätsel Sprechen").
- **Kartensätze abgeschl.:** This column shows how many card sets the respective player has mastered in all available game modes. This means that players only receive an entry in this column when they have successfully completed at least one set of cards in the "Memory" game mode in all three available levels (Level 1, Level 2, Level

3) and in the "Bilderrätsel" game mode in both game variants "Schreiben" (write) and "Sprechen" (speak). The column with this statistic is not shown in Figure 5.9 because of space limitations.

By default, the position of the players in the ranking is arranged in descending order according to the earned experience points (Exp). This means that the first player has earned the most experience points, the second-placed player has earned the second most, and so on. The criterion for ranking can be changed by clicking on the column headers. For example, the ranking can be based on the current amount of coins (Münzen), the most successfully played sets of cards in the game mode "Memory" - Level 1 (Bronze colored trophy) etc. This is to motivate players who maybe have not earned the most experience points, but appear among the best players in other statistics.

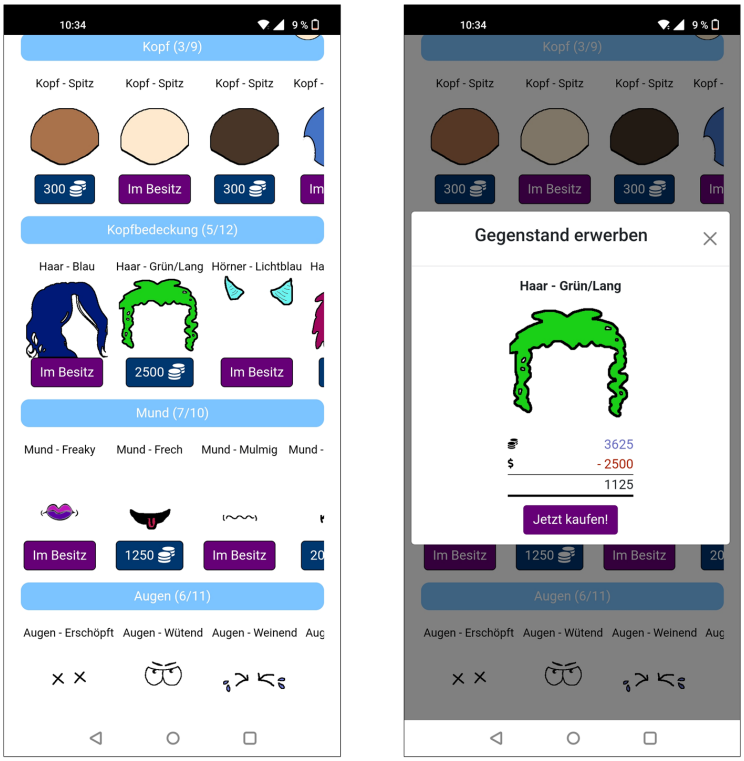
5.3.4. Coins and shop

Almost every multiplayer game these days has some sort of in-game currency, which can be exchanged in an in-game store for cosmetic items, game-enhancing skills, experience boosts and more. This type of synthetic currency is obtained by completing various tasks within the game [14].

From a psychology perspective, a trade appeals to the same centers in the brain whether it is done with real money or in-game currency. A kind of game economy is created, which in the broadest sense reflects the state of the game. Players evaluate whether buying or selling an item has a positive benefit and therefore makes sense to complete it [14]. Byron Reeves and J. Leighton Read describe rewarding via in-game currency as follows: *"A reward with a synthetic currency is like a social micropayment-it's not consequential by ordinary financial standards (worth only pennies if you were willing to take the time to trade it), but it's a precise, quantitative marker that is informative and even fun"* [14, p. 79].

From the studies and research analyzed in Chapter 4, it can be concluded that this type of game element is not often applied or investigated in the context of educational games. Therefore, it is important to analyze in-game stores in connection with virtual currency in the context of this study. In the "Lernen&Spielen" application, the shop is designed to allow users to purchase cosmetic items for their avatars. The virtual money they need to buy these items is awarded to them in the form of coins when they complete games in any of the game modes (for example see Figure 5.3). Users also get a "coin multiplier" during playing if they don't make mistakes and provide many correct answers in a row. Figure 5.10 shows the shop (a) and the purchase process of an item (b).

As already mentioned in section 5.3.1, an avatar can be customized in four areas: Head, headgear, mouth and eyes. Users can choose from a total of 42 items, including nine different heads, twelve different headgears, ten mouth shapes and eleven items regarding eyes. A click on an item which has not been purchased yet opens the purchase screen shown in Figure 5.10 (b). The item is shown again and it is calculated how the purchase would



(a) (b)

Figure 5.10.: A snippet of the in-game shop (a) and the purchase process for an avatar item (b).

affect the current account balance. The process can either be canceled or completed by clicking the "Jetzt kaufen!" (Buy now) button. Once the item has been successfully bought, it can be used to customize the personal avatar (see Figure 5.7 (b)).

The fact that users can decide for themselves on which item they spend their earned money is likely to be beneficial to satisfying the basic need for self-determination. In addition, users can be motivated both intrinsically and extrinsically to play the game if, for example, it allows them to acquire an expensive item to gain some sort of reputation.

5.3.5. Duels with time pressure

Every game, whether in digital or traditional form, has rules that players must follow. Even for educational games, clearly defined rules set boundaries and determine what actions learners can perform. A game can thus be seen as an artificially created conflict between players. The outcome of the conflict is a quantifiable result [42]. Especially applications on smartphones have proven that integrated competition can increase player engagement in

a game enormously [43]. The fact that game elements which force competition between players can have a strong motivational effect is also underlined by the statement of Gregory Trefry: *"After all, winning a single-player game feels like an accomplishment; beating your friends feels like a triumph"* [44, p. 234].

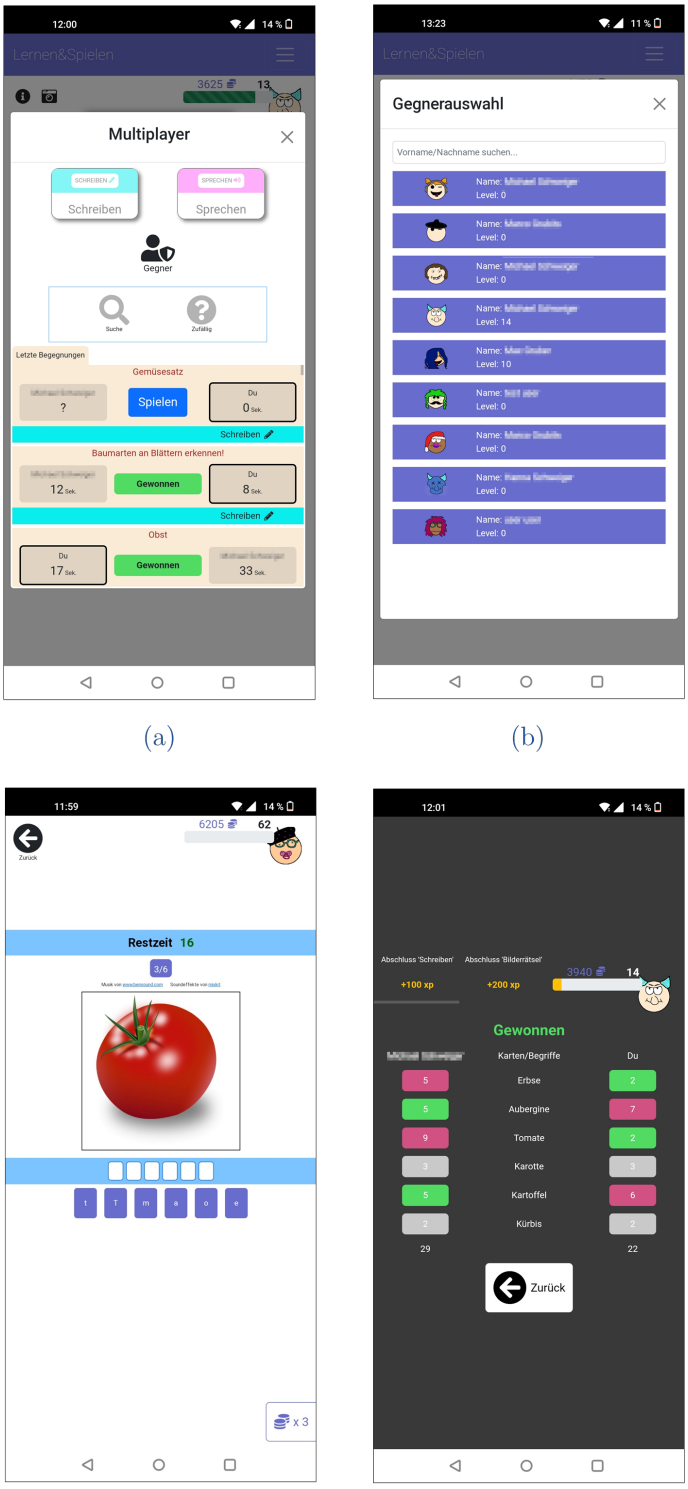
The mechanics that video games employ for competition go back to Festinger's theory of social comparison processes [45]. According to this theory, competitive behavior is achieved through comparisons on a social level. Thus, video games rely on all those game elements that create some kind of discrepancy, such as moving up in rankings, defending reputation, etc. Therefore, players compete for example for the first place in the ranking or the best time in a certain game mode. Nevertheless, one can distinguish between four so-called goal structures:

- **Cooperation:** A group of players pursue common goals.
- **Collaboration with cross-group competition:** Multiple groups of players with the same goals internally in the groups but different goals between the groups.
- **Interpersonal competition:** Competition between players focusing entirely on exclusive goals.
- **Individualistic efforts:** All about independently goals [43].

Further research defines new types of competition such as artificial competition, which focuses on the competitive relationship between the player and the system. This include games where players compete alone or in groups against the system itself [43].

Competitive features can stimulate the creativity of players by requiring them to use more complex strategies to defeat their opponents. Also, in video games which are used for educational purposes, such activities are crucial, because players set themselves clear goals. With the help of social comparisons, performance orientation moves into the background and existing individual abilities into the foreground. The intrinsic motivation of the players is addressed and the fun towards the game is increased, which is especially important for novice learners. This can have positive effects in terms of learning success, as learners study more precisely and spend more time on it. However, it also shows that competition can have a negative impact on learners by weakening their metacognitive abilities [43]. That means it can have negative effects on the ability to reflect and evaluate one's own actions.

Figure 5.11 gives an impression how a duel is organized in "Lernen&Spielen". A duel takes place in the game mode "Bilderrätsel". In other words, either the game variant "Schreiben" or "Sprechen" (see section 5.1 for more details on the game variants) can be selected to start a multiplayer game. Figure 5.11 (b) shows how the opponent selection takes place. A player who is ready for a duel can choose an opponent by browsing the list of available players. The avatar, the name and the current level of the respective player are displayed.



(a) (b)

(c) (d)

Figure 5.11.: Flow of a duel in the educational game “Lernen&Spielen”.

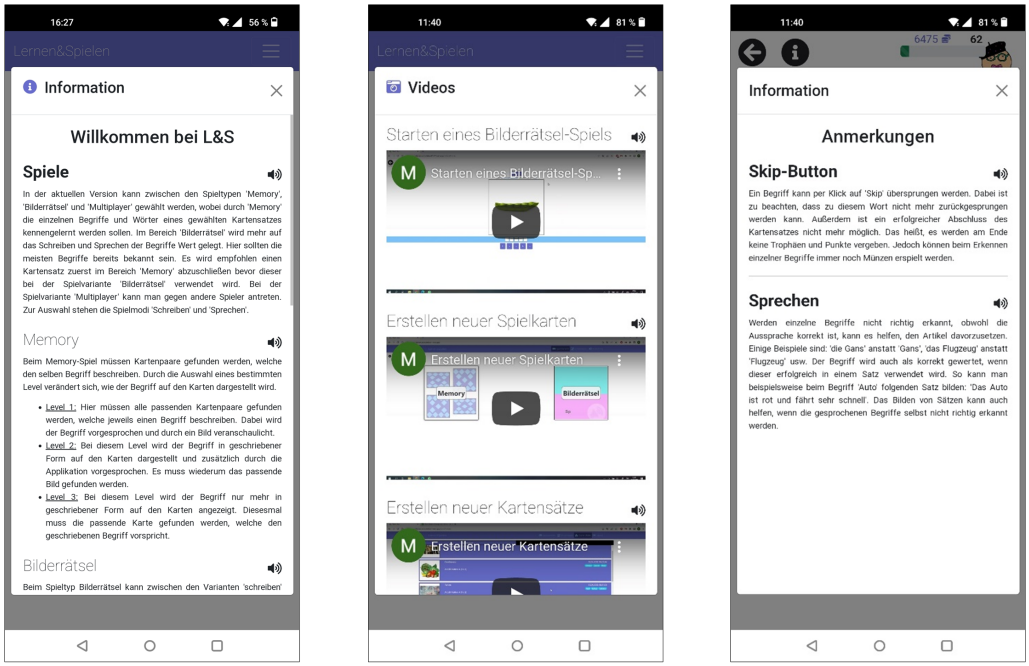
If a duel is started between player A and player B, player A first finishes the selected set of cards in the chosen game variant. A time limit of 20 seconds is set for each term, during which a correct answer must be given (see Figure 5.11 (c)). If no correct answer is given within this time limit, the game automatically jumps to the next term for which the player again has 20 seconds. The required time per term is stored and summed up to a total time at the end of the game. After player A finishes the set of cards, player B receives a push notification on the respective device what is used for playing. It informs about the fact that player A wants to compete against player B. Player B can accept the challenge by pressing the "Spielen" button in the corresponding row in the list which is called "Letzte Begegnungen" (see Figure 5.11 (a)). Player B also completes the card set and tries to correctly recognize all terms as fast as possible. When player B has completed the duel, the results of both players are compared, which can be seen in Figure 5.11 (d). On the one hand, the partial times for the respective terms are compared separately, on the other hand, all partial times are added to the required total time. Green background means that the player recognized the term faster than the opponent, red that the opponent was faster and gray that both players needed the same amount of time. The winner is the player who has the shorter total time. Player A in turn receives a push notification that player B finished the duel and a result is available. Player A can inspect it by clicking on the respective entry in the "Letzte Begegnungen" list.

A duel takes place asynchronously. This means that a player can start a game and the opponent can finish it at any time. This has the advantage that both players do not have to play the game at the same time. Duels are meant to be a way for learners to compete against their friends and be motivated to learn in order to be able to beat them. Besides competition, duels also award experience points and coins, which are necessary for leveling and buying avatar items. Therefore they also affect the position of the respective player in the ranking list (see section 5.3.3).

5.3.6. Guides and video tutorials

In [46], a tutorial is defined as *"[...] any component of a digital game that is intended to teach someone how to play"* [46, p. 18]. This definition is very general and ranges from introductory levels to helping instructions on the screen. Such elements in the game can help users understand how to use the game and how specific functionalities work. Players who have no idea how to play or do not understand the way certain game mechanics behave will quickly lose their motivation to play the game. As game developer, one cannot always assume that all users are experienced "gamers". Newcomers in particular need to be supported in their use. In addition, assistance of any kind is also becoming more important for the reason that interactivity in games is increasing. One example is World of Warcraft, where players spend more than 10,000 hours of gameplay improving their characters by equipping them with new items and teaching them new skills, exploring the environment or completing quests. Only few players would likely play a game of this complexity if they had to figure out on their own how all these game mechanics work [46].

According to [46], tutorials can be divided into two groups depending on whether they convey information using the didactic or exploratory teaching method. Didactic knowledge transmission in relation to digital games takes place by presenting players data to which they are supposed to react. Examples from the video game universe are reaching the marks on a mini-map, reacting to command instructions from NPCs, etc. Especially beginners are addressed by this kind of knowledge transfer. The so-called worked-example effect occurs. People who are inexperienced in a field can better deal with complex problems in this unknown domain if they encounter solutions for similar tasks. Explorative teaching means that learners experiment independently. The focus is on making mistakes, from which the learners should benefit. Thus, tutorials are also based on the fact that players should try out certain things without receiving precise instructions. For example, games can give only a few hints to "push" the players to discover the game world on their own.



(a) (b) (c)

Figure 5.12.: Some examples of the guides and tutorials available in the educational game "Lernen&Spielen".

The pop-up windows shown in Figure 5.12 (a) and (b) can be accessed from the game overview screen (see Figure 5.1 (a)) by pressing the buttons in the upper left corner. The first one displays general information about the application. Users can view instructions on the available game modes and learn how to create new content. Furthermore, game elements such avatars, levels and coins are described. The second button opens the video

window. There, users can watch video tutorials of individual game mechanics. Some videos are "Starting a Bilderrätsel game", "Creation of new game cards", "Avatar, levels and coins". In these videos, step-by-step guidance is given on how to use the application. Also, in certain game modes, there is more information that can be accessed directly while playing via the information button (i). The pop-up window shown in Figure 5.12 (c), can be opened when playing the game variant "Sprechen" and describes special mechanics in this specific game mode. As both the help and the video tutorials contain detailed instructions (step-by-step instructions), it is possible to assign them to the didactic group of tutorials. They are intended to assist those students who have little experience with digital games.

In the study by Schwaiger, Markus Ebner and Martin Ebner [47], which was conducted in Austria and aimed to improve the German language skills of primary school students with the help of a tablet application called "Die Schokoladenfabrik", it was observed that information in textual form is mostly ignored by the students. By integrating the Web Speech API in the "Lernen&Spielen" application to allow speech output, all information that is available in text form can also be played back acoustically. Users simply have to press the respective "speaker" buttons (see Figure 5.12 (a) and (c)). The main purpose of this is to ensure that textual assistance is not simply ignored by the students. As the application is also used in German as a second language instruction, where students may not yet be able to read entire texts in German, the speech output is intended to make it easier for them to obtain important information on how to use the application. However, the video tutorials are meant to help these users, as they show visually and at a reasonable pace how the individual mechanisms work.

The target group, which use this application, should get the feeling that help is always available. As a result, the motivation for the game should increase. However, this does not mean that experienced students, friends or teachers cannot or should not help unconfident learners in using the tool.

5.4. Usability

In order to evaluate the usability of the learning game "Lernen&Spielen" and to determine whether it is sufficient to ensure that any demotivation perceived by the participants of the conducted study (see chapter 6) is not a result of insufficient user-friendliness, the method "Think aloud" was implemented with four people. In the literature, the paper [48] by Ericsson and Simon serves as base document on which the method was developed [49].

The four people were distributed over two perspectives for testing the usability of the game. Two children, one from Turkey, the other one from Great Britain, each 9 years old tested the learning game from the learners' perspective. The two other participants, a teacher from Turkey who teaches German as a foreign language and a person from the faculty of Computer Science of the University of Vienna, evaluated the educational game from a teachers' perspective. All interviews were conducted through an online meeting

where each person had to work through five scenarios using the learning game. The scenarios were different for the two considered perspectives (see Appendix - A.1). While accomplishing these tasks, the people were "thinking aloud". At the end of the interview, respondents answered the System Usability Scale (SUS) [50] questionnaire, which consists of ten statements. This allows to calculate the SUS score for the system, which reflects the usability of it. The value range of this score is between 0 and 100, where 100 corresponds to perfect usability.

Learners' perspective

Both children completed the test scenarios while one parent was present during the session. No major assistance had to be given in any of the tasks. The children intuitively understood how the system works, how games can be started, items purchased and avatars customized. The SUS scores calculated from the SUS questionnaires are 85 and 90, resulting in an average score of 87.5 for the learner perspective.

At the end of the interviews, there was a general discussion about the application, allowing also the parents present to express their opinions about it, which brought interesting insights. According to their statements, both children frequently use digital devices in everyday life and play a wide variety of games on them. The parents liked the learning game and considered it to be useful and well implemented. Both could imagine using such kind of digital applications to learn the German language themselves. The children were very interested and would support the integration of such games into the school lessons.

Teachers' perspective

In contrast to the perspective of the learners, the teacher scenarios placed more emphasis on the creation of new content (new cards and card sets). Both people reviewing the application for usability from this perspective needed assistance with task two - creating new cards. Support was needed during the process of adding an image to the card. It was explained how to copy the address of a selected picture from the pixabay website so that it could be pasted into the corresponding input field when creating new cards. This task consists of adding two new terms (cards). Both test persons were able to add the second term quickly and without problems after they had assistance in creating the first card. All other tasks did not pose any major challenges and could be completed quickly.

By thinking aloud while completing the tasks and the final general conversation with the interviewees, some insights could be gained. One person indicated that the computer-based pronunciation of words could cause problems. It is understandable for most words, but some words do not sound well. Improvements could possibly be made in this direction. Also, the demand for new content is present. It would be good to support new game variations, such as forming sentences or exercises with interactive videos. In addition, one person stated that the buttons on the "Deine Inhalte" page (see Figure 5.5 (a) and Figure 5.6 (a)), which can be used to switch between the "card view" and "card set view",

do not indicate well which button (which view) is currently active. In this case, the buttons could be redesigned or a different color scheme could be applied.

Nevertheless, both of them believe that the learning effect using the application is high. Once a new term or card set has been created, it is easy to generate more content, as the process always follows the same pattern. They stated that they enjoyed to add new content. The fact that content can be created by the instructors also allows the teachers to predefine specific content for the students to learn. This is an extremely positive feature. They also believe that it would be a lot of fun for the children to learn the meaning, spelling and pronunciation of new terms in this way.

Both show a good rating towards usability with scores of 60 and 90, resulting in an average value of 75.

Various research studies around SUS have shown that already a small number of test persons are sufficient to determine the basic usability of a system. Thus, about five to seven participants are enough to identify 80 % of the difficulties related to the use of a software program [51]. Calculating the overall System Usability Score for the educational game by taking the scores of all four test persons, an average value of 81.25 is obtained. Bangor, Kortum and Miller [52] divide the SUS interval into the following sections to allow interpretation:

- **0 - 50**: Not acceptable
- **50 - 70**: Marginal
- **70 - 100** Acceptable

According to this interpretation, the educational game achieves acceptable usability. Following an even more detailed classification by Bangor, Kortum and Miller [52], 81.25 points are considered as a good, almost excellent usability.

By conducting the interviews using the "Think aloud" method and the calculation of the SUS score, it can be shown that the educational game has a sufficiently good usability so that the results of the conducted study, which are shown in chapter 6, are not caused by insufficient usability and occurred primarily due to the implemented game elements.

Chapter 6

6. Lernen&Spielen in practice - The application in GSL instruction

The learning game "Lernen&Spielen", which is described in more detail in chapter 5, was applied in the context of German as a second language (GSL) instruction at an Austrian middle school. The aim is to find out how the integrated game elements influence the students' motivation. The study serves as a basis for answering the main research question:

Research question 1

Do gamification elements integrated in a digital learning game which is used in the course of German as a second language instruction have an impact on the motivation and engagement of the participants with regard to the serious task "language learning"?

Before the start of the study, the educational game was introduced to the potential participants during a GSL lesson. The students showed interest in the learning game, so it was agreed with the teacher to use the learning game in their lessons. In addition, a document specifically for educators was provided (see Appendix - A.2). It contains information about the available game modes as well as recommendations about which devices and browsers are best suited for use.

6.1. Methodology

The educational game was used for a total of six hours in four sessions. Students worked with the game for two hours in each of the first two sessions and one hour in each of the last two sessions. All lessons were conducted in the IT lab, which was provided by the school. Sufficient Internet-enabled desktop PCs were in place so that all participants could use the learning game in a meaningful way. Additionally, enough headsets were available to be able to use the full content of the game. The browser software used by participants to access the educational game was Microsoft Edge and Google Chrome.

Participants

In GSL instruction, students from different school levels and with different language skills take part. Figure 6.1 shows the participants distributed according to their age and gender.

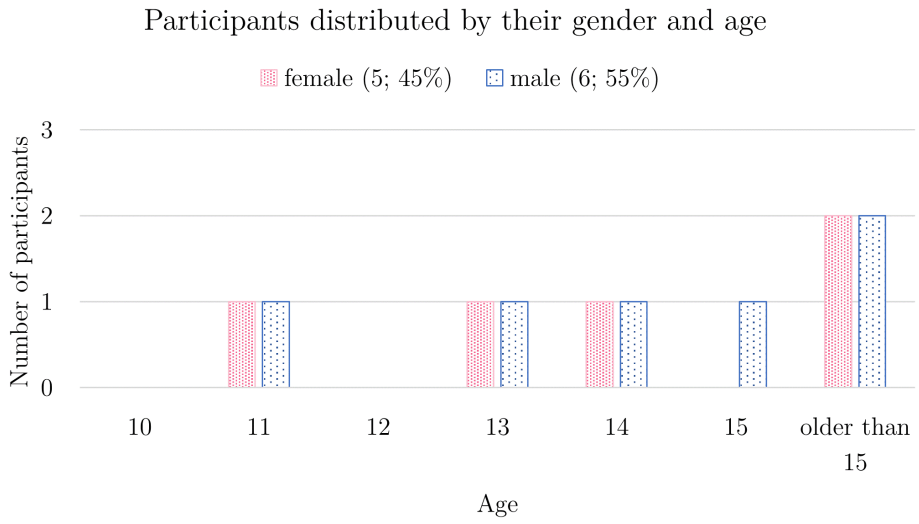


Figure 6.1.: Participants distributed by their gender and age.

In total, the study was conducted with eleven students, five of them being female and six of them being male. The age distribution shows that four of the eleven participants were already older than 15 years. Figure 6.1 illustrates how large the age difference of students in this type of instruction is.

The difference between the participants is not only reflected in their age, but also in how well they have already mastered the German language. The language levels ranged from A1 to B2, with A1 meaning that simple sentences can be understood and easy communication is possible. At level B2, students are capable to use the language in a more complex way. More difficult texts, even on abstract topics, can be understood and interpreted. However, the conduction of the study showed that a higher age does not necessarily mean that a better level of language competence has already been achieved. There were also participants who had already achieved a good level of language proficiency at a young age.

Use of the educational game

Before the students were able to use the educational game, each participant got a personal account so that the progress in the game could be stored, in addition they had to fill out a pre-questionnaire. The participants were supported in creating the accounts. Once all required accounts were successfully created and the needed headsets were ready for use,

the educational game could be explored without any special requirements. Participants could play any game mode with a wide variety of card sets. The game mode, the card set and the terms they should learn were not predetermined. All participants could decide independently which terms they wanted to learn and in which way. Students were able to get help from the present persons whenever they needed it.

Questionnaires

In the course of the study, two questionnaires were completed by the participants. The preliminary questionnaire (see Appendix - A.4) was answered at the beginning of the study. It asked how students use digital devices and how they currently learn German. This questionnaire include single-choice, multiple-choice and open questions.

The post questionnaire (see Appendix - A.6) was answered by the participants at the end of the study. It focused on how the students experienced the learning game "Lernen&Spielen". Particular attention was paid to the game elements that were integrated into the game to increase motivation (see section 5.3). In addition to single-choice, multiple-choice and open questions, this questionnaire was expanded to include one more type of answer possibility: a scale rating. With the help of this scale, the motivation that the individual participants felt through a specific game element is evaluated.

All participants answered the German version of the questionnaires (see Appendix - A.3 respectively A.5).

Interview with the teacher

At the end of the study, a so-called semi-structured guideline interview was conducted with the teacher. The aim is to show how the application was perceived from the teacher's point of view, whether there are suggestions for improving the application and if the teacher could imagine using the learning game further in the classroom.

Annotations to the study

The study was started with eleven participants. They answered the pre-questionnaire and participated in all sessions in which the learning game was used. When answering the post-questionnaire, however, only ten participants were able to take part because one person had withdrawn from school shortly beforehand. For the evaluation of the study, this means that eleven participants are considered in the analysis of the pre-questionnaire as well as the game data and only ten in the evaluation of the post-questionnaire.

6.2. Findings

For this purpose the pre-questionnaire (PreQ), post-questionnaire (PostQ) and game data, which were collected during the application of the learning game in class, are evaluated. In

addition, the interview with the teacher is analyzed.

6.2.1. Pre-questionnaire evaluation

The PreQ was used to determine how the participants of the study use digital devices as well as how they currently learn German and whether digital learning games are also used in this context. Figure 6.2 shows which devices the students use more often in everyday life. A distinction is made between mobile devices such as smartphones or tablets and desktop devices such as PCs or laptops.

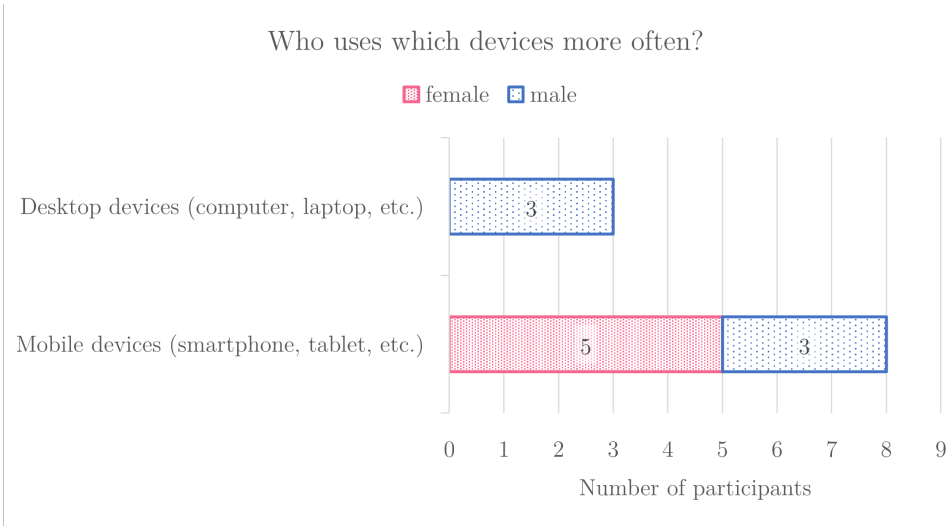


Figure 6.2.: Device usage split by gender.

The trend is clearly in the direction of mobile devices. 73 % of all participants state that they use this type of equipment more often. It is also interesting to see that all female participants prefer smartphones or tablets, whereas among the male participants there is a balanced distribution between mobile and desktop devices. The average time per day participants spend with such devices varies widely across the group. However, it appears that all of them actively use them for at least one to two hours a day. Six out of eleven even use them for four or more hours. Today's students can no longer imagine a life without digital devices. This indicates that there is great potential for digital learning games, especially for mobile applications.

The PreQ also brought the insights that digital learning games for German are nothing unknown. Nine out of eleven participants have already used a learning game as a support for learning German. Of these, six students used the learning game "Duolingo" [53], which is specifically designed for language learning. One person used "Kahoot" [54]. This learning platform, unlike Duolingo, was not developed specifically for learning a language. It can be used as a learning medium for a variety of subjects. The remaining two participants,

who stated that they had already used a digital learning game for learning German, could not remember the name of the game. Figure 6.3 shows how the respondents are currently learning German.

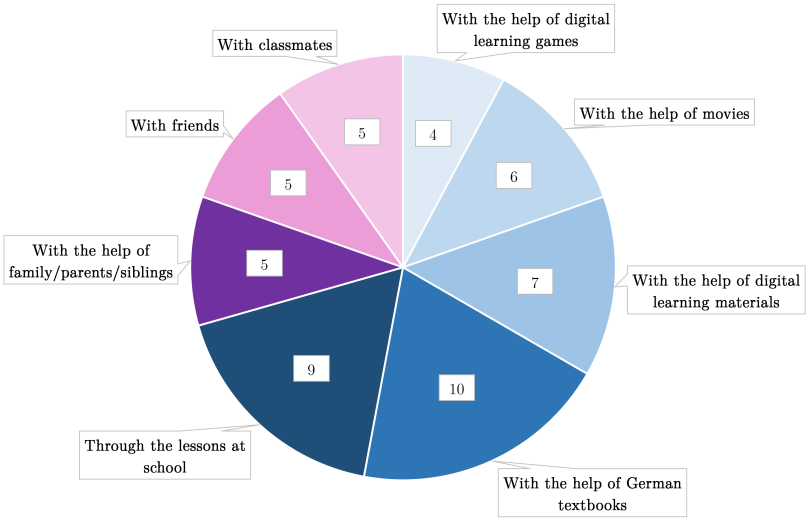


Figure 6.3.: How is German learned.

Although nine of all respondents have already used digital learning games to learn German, only four are currently learning with the help of such software. This shows that those games have not been able to motivate the users to learn over a long period of time. Traditional methods and teaching materials such as German textbooks or the lessons in school are still mentioned the most when talking about how the German language is learned. Figure 6.3 illustrates also that less than half of the participants receive support from their family. Only five students learn together with their parents or siblings.

The question "Why are you learning German?" in the PreQ was intended to determine whether the participants already feel a kind of motivation to learn German. The answers given speak for themselves, therefore it can be clearly claimed that the participants are extrinsically motivated towards learning the German language. In order to illustrate this, some of the answers will now be presented. They are translated from German into English in such a way that the statements are not changed.

Why are you learning German?

"Because I want to stay in Austria."

"Because I live in Austria. I need to understand the lessons at school."

"Because I want to be able to talk to my friends. [...]"

"Because I want to stay in Austria. I love the German language and I want to understand it."

Putting these responses in relation to the types of extrinsic motivation presented in chapter 3, it can be argued that most participants experience the motivation types "work-related" and "social-based". They want to stay in Austria, so they need to understand the lessons at school, which is enormously important for them to be integrated into society. The fact that all participants think that it is important to be able to speak/write/read German in Austria further underlines this conclusion. Eight of them even consider it as very important.

Asked how often digital devices are used in class to learn German, five of the eleven participants stated that such devices are used in almost every lesson. Three indicated that they are used once a week. Of the remaining three, two responded that these devices are used once a month in class and one participant replied that they never use digital devices. By talking to the participants and the teacher, it was discovered that digital devices are only very rarely used specifically in class and are not often explicitly integrated into the lesson by the teacher. Instead, the learners use this type of device more for translating words they do not understand in German into their native language. The use of such devices in German lessons for playing learning games or performing exercises is lower than the participants' statements would suggest at first glance.

Figure 6.4 shows that most of the people participating in the study are interested in learning German with a digital learning game. However, there are also four students who are undecided or rather against learning with the help of this kind of games. Thus, it can be assumed that the majority of today's students, who have already grown up with digital devices and use them very often in everyday life, are also ready for learning with the help of such devices. However, it cannot be concluded that all students really want to be taught in this way.

The actual traditional GSL instruction was followed for four hours to see how it is structured and what materials are used. The teacher interacts very well with the learners. In the lessons, it is tried to be as diversified as possible. In addition to grammar exercises, attention is paid to the fact that the students communicate a lot with each other so that they use the German language regularly and individually in order to improve their skills. There are also listening exercises to integrate the aspect of "hearing and understanding"

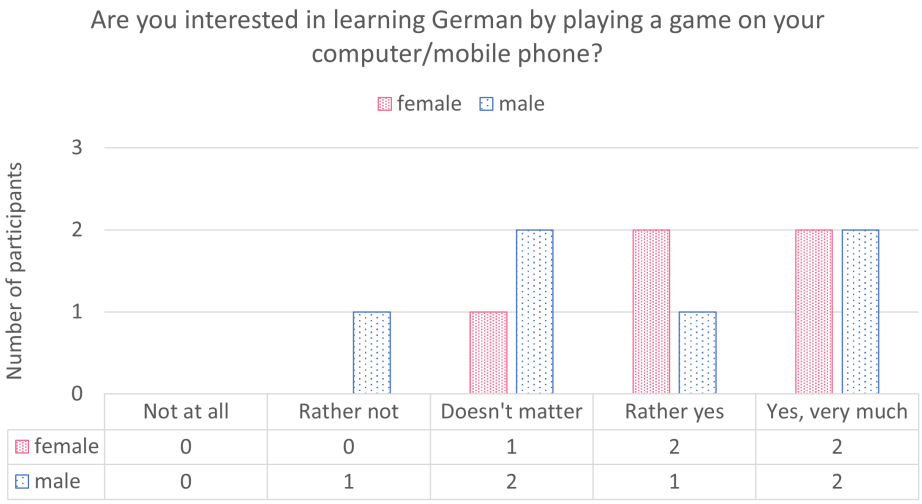


Figure 6.4.: Participants' attitudes towards learning German using digital educational games.

into the lessons. Most of the exercises are taken from a textbook intended specifically for learning German, but which is currently only available to the teacher. Thus, copies of the respective exercises or tasks have to be made and handed out to the children. This is a bit cumbersome, because after a certain time and many different exercises, a large number of pieces of paper accumulate. It can happen that some students forget certain pieces of paper at home or even lose them. For this reason, it would be beneficial to provide each child its own exercise book. Of the students involved in the study, seven indicated that they enjoy the traditional lessons and have fun in them. One of them even enjoys it very much. The remaining four find this kind of instruction okay.

6.2.2. Game data evaluation

The fact that learners use their own account while playing means that game data is stored and can be analyzed. In addition to this kind of information, additional insights about the user's behavior are collected via Firebase Analytics.

Memory			Bilderrätsel			
Level 1	Level 2	Level 3	Schreiben (Write)		Sprechen (Speak)	
			single-player	mulit-player	single-player	mulit-player
124	73	211	542	65	207	16

Table 6.1.: Number of successfully completed card sets distributed among the game modes.

The eleven participants were very active during the six hours in which the learning game was used. These hours of application are spread over four sessions. In the first two sessions (sessions 1 and 2), the educational game was used for two hours each. In the final two sessions (sessions 3 and 4), the learning software was only used for one hour per session. Table 6.1 shows how many card sets were successfully completed in each game mode. In this case, "successfully completed" means that all the terms contained in these card sets were correctly recognized.

A total of 1238 card sets were successfully played. A set of cards contain either four, six or eight cards. One card represents one term (see chapter 5 for more details). Taking the 1238 sets of cards and adding up their cards gives the impressive sum of 6714, which is the number of terms the students "learned" in the six hours the educational game was used. Figure 6.5 shows the played card sets distributed over the four sessions.

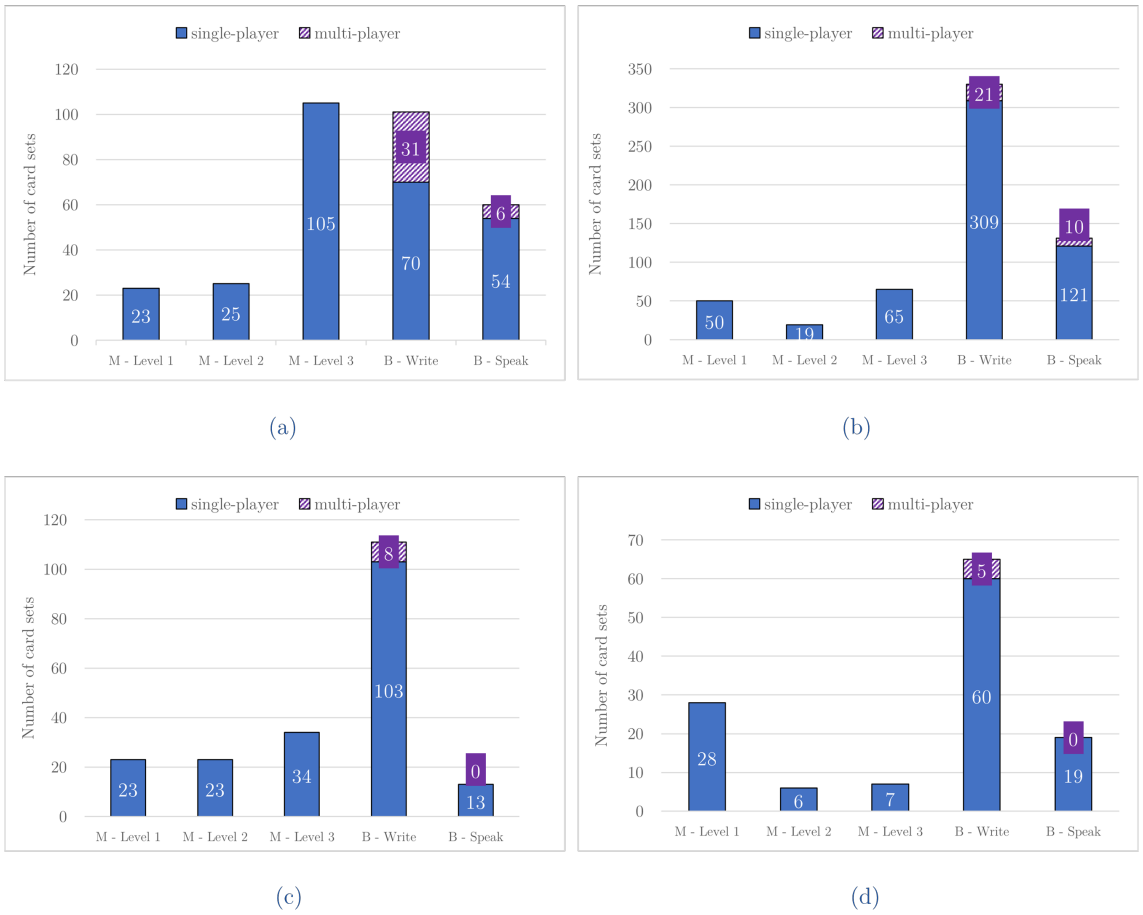


Figure 6.5.: Number of successfully completed card sets distributed among session 1 (a), session 2 (b), session 3 (c) and session 4 (d).

If a comparison is made between the individual game modes, one can see that the "Bilderrätsel - Schreiben" mode was played most frequently. The learners had to sort disordered letters in such a way that they form the relevant term. Looking at the difficulty level of the individual game types, the "Bilderrätsel" mode is more demanding than the "Memory" game mode. From the observations during the application of the learning game in class and the analysis of the game data, it can be concluded that the "Memory" mode was perceived as too easy for the majority of the participants and was therefore played less. The game type "Sprechen" was roughly played as often as level 3 in the "Memory" mode, but not even half as often as "Schreiben". In "Sprechen", the learners had to enter a word represented by a picture by means of voice input. Some terms can be difficult for a digital system (computer, smartphone, etc.) to understand, especially when there is no context. Wrapping them in a sentence or adding articles improves the recognition rate enormously. Possibly, the recognition of spoken words was too rare, so that the learners preferred to play the "Schreiben" mode.

Using Firebase Analytics, user behavior can be analyzed even more precisely. It is possible to log so-called events. Additionally, user-defined dimensions can be configured, which can be used to store further information per event. In this way, the behavior of learners during the use of the game "Lernen&Spielen" can be described in more detail.

The educational game allows in principle to select a card set for starting games in three different ways. A distinction is made between random, specifically searched and an already played card set, which can be selected from the list of the last played card sets. Using Firebase Analytics, three events are logged (Search_CardSet, Random_CardSet, List_CardSet), which store how often which option is used. Custom dimensions additionally store which card set selection variant was chosen for which game mode or level.

Memory			Bilderrätsel		Multiplayer	
Level 1	Level 2	Level 3	Schreiben	Sprechen	Schreiben	Sprechen
Search_CardSet - Total 480						
33	21	62	221	69	61	13
31.13 %	61.76 %	39.24 %	54.84 %	29.74 %	73.49 %	52.00 %
Random_CardSet - Total 523						
70	13	86	163	157	22	12
66.04 %	38.24 %	54.43 %	40.45 %	67.67 %	26.51 %	48.00 %
List_CardSet - Total 38						
3	0	10	19	6	Not available	Not available
2.83 %	0.00 %	6.33 %	4.71 %	2.59 %		

Table 6.2.: Comparison between the three different ways to start a game.

Table 6.2 shows that random selection was used most frequently. However, the card sets were also very often selected specifically. The option of picking card sets from the list of

the most recently played ones was not used that often.

Looking at the individual game modes separately, differences can be seen. In the "Bilderrätsel - Schreiben" mode, the players picked more often card sets (terms) on purpose, rather than playing with random ones. In the "Sprechen" mode, it was the other way around. A very interesting finding is that learners in multiplayer mode tended to choose specific card sets to start a game rather than random ones. This could be due to the fact that it was important for them to use terms they had already practiced in order to have a good chance of winning the duel against another real player.

Table 6.2 illustrates also that it is not unimportant for learners what they learn. In the case of the learning game "Lernen&Spielen", learners often want to decide for themselves on which topic new terms should be learned. However, starting games with random content should be considered as well. On the one hand, a game can be started fast and easily, allowing new knowledge to be learned quickly. On the other hand, there is a certain riding of uncertainty, which new terms will come up.

When completing games, the users can choose between three options on how to continue. They can either return to the game overview page, play the same game mode again with the same terms or press the "Game mode" button to play the card set in the next higher level ("Memory") or in the other game mode ("Bilderrätsel"). Tables 6.3 and 6.4 show how often which option was used in the "Memory" and "Bilderrätsel" mode. The "Multiplayer" mode only provides the functionality to return to the game overview page and is therefore not listed.

Memory								
Back			Again			Game mode		
Level 1	Level 2	Level 3	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
52	28	162	31	4	48	38	41	Not available
42.98 %	38.36 %	77.14 %	25.62 %	5.48 %	22.86 %	31.40 %	56.16 %	
Total		**242**	**Total**		**83**	**Total**		**79**

Table 6.3.: Usage behavior regarding "Continue after completing a game" in "Memory" mode.

Looking at the "Memory" mode, it can be noticed that the players very often returned to the game overview page after a game was finished. However, card sets were also played continuously in all three levels using the "Game mode" option. At level 3, there is no higher level available, which means that users can only choose between the two options "Return to game overview page" or "Play again". After all, 83 times card sets were played again in the same mode.

Bilderrätsel					
Back		Again		Game mode	
Schreiben	Sprechen	Schreiben	Sprechen	Schreiben	Sprechen
248	134	251	55	45	21
45.59 %	63.81 %	46.14 %	26.19 %	8.27 %	10.00 %
Total	**382**	**Total**	**306**	**Total**	**66**

Table 6.4.: Usage behavior regarding "Continue after completing a game" in "Bilderrätsel" mode.

The "Bilderrätsel" mode shows a similar picture. Here, too, the most frequent decision was to return to the game overview page. Nevertheless, the same mode with the same card set was played again proportionately more often than in the "Memory" mode. Switching between the game variants "Schreiben" and "Sprechen" was rather rare.

It can be concluded that the learners would like to have some variety while learning. This is shown by the fact that very often after completing a game, they switched to the game overview page, which gives them the option of starting other game modes with different card sets. However, the other options have also been used and should definitely be offered, as this allows switching quickly between the individual levels or game variants. In addition, terms can be easily and fast practiced again in the same mode. A cumbersome selection of the same settings on the game overview page is omitted, which means that learning can be continued without delay.

Adding the numbers in Table 6.2, 6.3 (except option "Back") and 6.4 (except option "Back") for each game mode, gives the total number of games started. Table 6.1 shows the number of successfully completed games so that the success rate and negated success rate for each game mode can be determined. In the following, the acronym SCGR is used for the Successfull Completed Game Rate. Table 6.5 summarizes this information in a clear manner.

	Bilderrätsel	Schreiben	Sprechen	Memory	Level 1	Level 2	Level 3
Total played	1007	675	332	460	137	76	247
Successful played	749	542	207	408	124	73	211
¬ Successful played	258	133	125	52	13	3	36
SCGR	74.38 %	80.30 %	62.35 %	88.70 %	90.51 %	96.05 %	85.43 %
¬ SCGR	25.62 %	19.70 %	37.65 %	11.30 %	9.49 %	3.95 %	14.57 %

Table 6.5.: Overview of the SCGR for each game mode.

Unsuccessful completion (¬ SCGR) means in this case that a game was cancelled by pressing the "Back" button to switch to the game overview page or that the "Skip" button was used, so that not all the terms contained in the card set were solved correctly. Looking at the "Memory" mode in general, one observes that only 11.30 % of all games started were not completed successfully. In the "Bilderrätsel" mode, on the other hand, slightly more than one quarter of all games were not finished with success. In percentage terms, it were more games in the "Sprechen" mode than in the "Schreiben" mode which were not completed successfully. The SCGR is only 62.35 % when considering the "Sprechen" mode individually. This is the lowest value compared to all other game variants. Either this game mode was perceived as too difficult or the voice input did not work sufficiently, which resulted in many unsuccessfully completed or aborted games. Level 2 in "Memory" mode has a very high SCGR of 96.05 %. Only three of all 76 games in this level were not finished with success.

The intention was to have different levels of difficulty in the game. The "Bilderrätsel" mode is supposed to be more challenging than the "Memory" mode. This is also reflected in the calculated SCGR's. All values are within a reasonable range, except for the "Sprechen" game mode. Here, the SCGR is comparatively low. Consideration should be given on how to redesign this mode to increase that value. This may require further research to find out more about the problems in this mode to determine why so few games were completed successfully.

With the global ranking, which is available in the application, the progress of the learners can be tracked separately. The status of the leaderboard at the end of the study is shown in Table 6.6.

Pos.	Name	Avatar	Level	Exp	Coins total	Items own					
1.	user 1		35	35850	57465	14	12	18	43	104	74
2.	user 2		19	19600	37835	6	1	4	51	39	56
3.	user 3		16	16550	18080	8	4	4	39	24	30
4.	user 4		15	15650	21075	8	3	2	36	51	32
5.	user 5		14	14600	22305	13	2	3	0	142	0
6.	user 6		13	13950	23070	6	73	6	6	46	20
7.	user 7		13	13800	14825	4	22	21	18	28	0
8.	user 8		10	10550	18655	10	1	3	6	79	10
9.	user 9		5	5500	11850	6	0	0	8	43	0
10.	user 10		4	4350	6165	7	2	1	3	34	0
11.	user 11		3	3750	5920	7	4	11	1	17	1

Table 6.6.: Global leaderboard - post study standings.

The leaderboard (Table 6.6) shows that the learners interacted a lot with the application. A large number of terms were learned by playing card sets in a variety of game modes. A

huge amount of coins were earned, which were spent on avatar items in the store. The "Avatar" column shows that all users have equipped their avatars with new items. Thus, it can be assumed that all of the integrated game elements were used frequently enough that the evaluation of these in section 6.2.3 offers a strong statement regarding the impact of them on the learners' motivation. The names of the users are removed for privacy reasons and replaced by dummy names. The first user in the ranking list is called user 1, the second user 2, etc.

Comparing the learners with each other, it is noticeable that user 1 played a lot of games. Therefore, that user could distance itself a little from the other users, regarding the level. Most of the users reached levels between 10 and 20. Three of the learners could not complete as many card sets successfully as the others and are currently still at a lower level. It is also interesting to see that for almost each game mode (except "Level 2"), there are people who have played it the most. For instance, user 1 played the "Bilderrätsel - Schreiben" mode most frequently, if one only compare the game data of that specific user. This is also true for "Level 1" (user 6 - 73 times), "Level 3" (user 3 - 39 times) in the "Memory" mode and for "Sprechen" (user 2 - 56 times) in mode "Bilderrätsel".

6.2.3. Post-questionnaire evaluation

The PostQ was used to find out how the learning game "Lernen&Spielen" was perceived by the learners. In particular, it was determined how the integrated game elements (avatar, feeback, points, levels and ranking, coins and store, duels with time pressure and guides and video tutorials) influenced the learners' motivation.

Six of the ten participants who answered the questionnaire stated that they had fun using the educational game, three of them enjoyed it very much. Another three learners considered the use of the learning game as ok, only one person had less fun while playing. Participants had the opportunity to indicate what they liked and disliked about the educational game by means of open questions. Some of these answers are presented below:

liked best	didn't liked so much
"Many new terms and their pronunciation."	*"There were no grammar exercises."*
"The possibility to learn new terms in an interesting way."	*"There are always the same games and this app does not improve my ability to form sentences."*
"It was very cool and good, I really enjoyed Memory."	*"The mode "Sprechen" because it is difficult for computers to understand your words."*
"I like multiplayer. I like to play with my girlfriend. I also like "Sprechen" mode."	*"Memory was very easy."*

These statements support the findings already derived from the analysis of the game data. Different participants preferred different game modes. Some found the "Memory" mode better, others the "Bilderrätsel" mode.

It is clear that many learners would like additional exercises (game variants). The statements show that additional games that focus specifically on grammar or sentence formation are desired.

When asked whether they would recommend the educational game to their friends, seven of the ten participants answered "yes". Looking at the answers more closely and differentiating between male and female participants, it is noticeable that five of the six male respondents would recommend the game. In contrast, only two of the four female students would be willing to recommend the game to others. This means that the game was more engaging for the male players than for the female ones. Nevertheless, 70 % of all learners who participated in the study are so convinced by the educational game that they would recommend it to their friends.

After the participants had sufficiently engaged with the game, they were able to indicate on a scale, which can be seen in Figure 6.6, whether they perceived the game elements as positive motivating (1 <=> 3), irrelevant (0) or demotivating (-1 <=> -3). They made this assessment as part of the PostQ, where a separate scale was available for each game element.

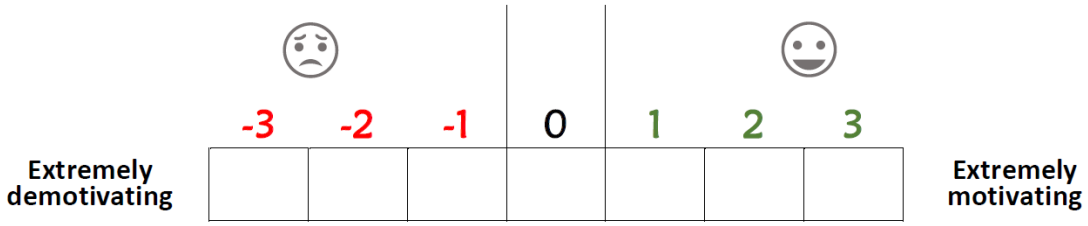


Figure 6.6.: Scale to rate the perceived motivation by a certain game element.

The literature distinguishes between several scale types. The variant, which is used in this work, is referred to as interval scale. Basically, it has the same properties as a nominal and ordinal scale. These are that the individual choices are mutually exclusive, meaning that only one option can be chosen. In addition, the answer options are related to each other. For example, if one chose 3 on the scale shown in Figure 6.6 means that a higher level of motivation was experienced by this game element than if the value 2 had been chosen. Of course, this also applies to the negative values, meaning -3 stands for more demotivation than the value -2. But in addition to these properties an interval scale is characterized by the fact that the distance between two neighboring scale points remains the same. Between option 2 and 3 there are as many points as between -1 and 0 or -3 and -2. This has enormous advantages for the evaluation, because established evaluation procedures (e.g. factor analysis or arithmetic mean) are very easy to determine [55].

However, there is not only a distinction between the basic scale types. For instance, a scale, or more precisely its options, can be fully verbalized, endpoint verbalized or not verbalized at all. In addition, it matters whether the scale has a midpoint or not, meaning whether there is some kind of "neutral" answer choice or not. The number of answer options also plays a major role [55].

All these properties have certain advantages and disadvantages. In the course of this study, it was decided to use an interval scale, which has seven response options, where only the endpoints are verbalized and where a midpoint exists. The advantage of endpoint verbalization is that the scale can theoretically be extended by any number of response options. Because only the endpoints and not all answer options are named, the result is always an interval scale. A possible disadvantage of a midpoint is that many people choose this point because they cannot or do not want to choose one of the two sides this point separates. But it can also be important to allow such a possibility of answering, as the scale in Figure 6.7 shows. Learners must be allowed to give a neutral answer if they were neither positively nor negatively affected by a particular element of the game. An endpoint verbalized scale should provide between five and nine options so that respondents do not have problems and can give appropriate answers. For this reason, the scale used to evaluate

motivation is composed of seven answer possibilities [55].

A so-called Element Motivation Score (EMS) is calculated for each game element based on the scores on this scale. All the ratings given are simply added together. The value range of the EMS in this context is between -30 and 30 points, because there are ten participants. The score range is further subdivided into the following sub-ranges, which are interpreted as follows:

EMS sub-ranges	EMS sub-ranges in %	Interpretation
-30 to -21	$EMS_{GE_{\%}} \leq$ -70.00 %	extremely demotivating
-20 to -11	$EMS_{GE_{\%}} \leq$ -33.66 %	strongly demotivating
-10 to -1	$EMS_{GE_{\%}} \leq$ -3.33 %	slightly demotivating
0	-3.33 % $< EMS_{GE_{\%}} <$ 3.33 %	neutral
1 to 10	$EMS_{GE_{\%}} \geq$ 3.33 %	slightly motivating
11 to 20	$EMS_{GE_{\%}} \geq$ 33.66 %	strongly motivating
21 to 30	$EMS_{GE_{\%}} \geq$ 70.00 %	extremely motivating

Calculation of the EMS

Assume that the EMS_{GE} of a game element GE should be determined, where N participants give their rating for this game element on the motivation scale. Let $R_{GE} = \{r_1, r_2, ..., r_n\}$ be the set of all ratings given by the N participants. The EMS_{GE} is determined as follows:

$$EMS_{GE} = \sum_{n=1}^{N} R_{GE_n}$$

The maximum value EMS_{max} that the EMS_{GE} can hold is determined by $EMS_{max} = 3 \cdot N$. The sub-range in which the calculated EMS_{GE} fits is calculated as follows:

$$EMS_{GE_{\%}} = \frac{EMS_{GE}}{EMS_{max}} \cdot 100$$

The considered game element GE is assigned to a sub-range according to the calculated $EMS_{GE_{\%}}$ and classified respectively.

Table 6.7.: Details of the Element Motivation Score (EMS)

In addition to indicate the motivation on that scale, learners could describe in their own words why they chose that rating. This means that they could indicate why they were motivated or demotivated by a particular game element. In the following sections, the

individual game components which are integrated into the game especially to increase motivation will be discussed separately. More about the functionality of these elements can be read in chapter 5.

Game element 1 - Avatar (GE1)

First, avatars are examined in terms of their impact on learners' motivation. Figure 6.7 shows some example avatars built by students in the course of the study.

Figure 6.7.: Avatars assembled by learners.

As these avatars and the ranking at the end of the study shows (see Table 6.6), all participants added items to their avatars. Objects in all four categories (head, headgear, eyes and mouth) were purchased from the store and finally attached to the avatars.

Figure 6.8 shows the ratings learners awarded on the motivation scale and the resulting EMS for the game element "Avatar".

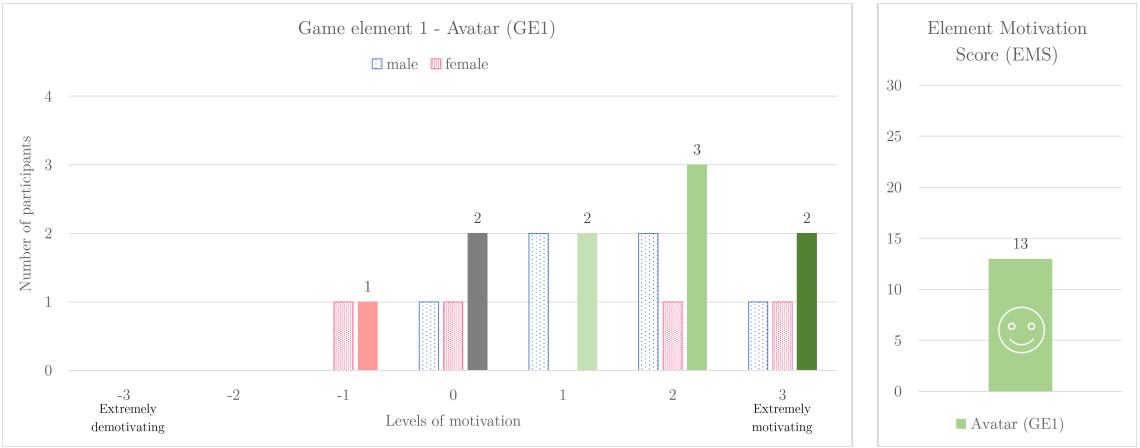


Figure 6.8.: Rating of the game element "Avatar".

Seven of the ten participants found the "Avatar" game element motivating. That includes five of the six male (83.33 %) and two of the four female (50 %) learners. A negative rating was distributed by only one female person. Calculating the EMS, the game element "Avatar" reaches a value of 13, which shows that this game element was perceived as strongly motivating. The following statements, which were provided by the learners, explains why a specific rating was chosen:

Why were you positively motivated/negatively motivated by the "Avatar" game element?

male 2
"Because "Avatars" also tell something about what level one is and how much money one has earned."

male 0
"The app didn't improve my knowledge that much and the avatars were bad too."

female 3
"Because I want a funny representation of me."

female -1
"Because these avatars are not pretty"

female 2
"I want to have a nice avatar because it's cool."

Based on the learners' statements, it is clear that the "avatar" game element has a positive effect on motivation. Both intrinsic and extrinsic motivation are addressed. On the one hand, people continue to play in order to be able to equip their avatars with more items. The autonomy of the players is satisfied by the fact that their own avatar represents them in the game. They can design it according to their wishes. It also triggers extrinsic motivation in the broadest sense. The avatar can also represent prestige. The more items and expensive equipment are used, the more one can show to other players (friends, competitors, classmates, etc.) how "good" one is in the game. This can have positive effects on the extrinsic motivation types "competition-based" and "social-based".

Participants who belong to the motivational learning mode "Learners", which Pereira, Morton and Gomes define in their work [13], are less interested in avatars. With high probability avatars are then rated as "neutral" with a score of 0 on the motivational scale. For this type of learners, the focus is on learning new knowledge. Therefore, this type of game element is usually ignored, as it does not transfer any additional know-how. The design of the avatar items themselves is also important. If users do not like them, they will not be motivated or even demotivated by this game element. It can be assumed that customization will never be able to positively influence all players, as they have different ideas about what is considered "beautiful" and "important" with regard to customization. Some will like it, others won't. Nevertheless, it can be concluded that avatars and thus customization result in learners being more motivated to play an educational game than without them.

Game element 2 - Feedback (GE2)

As already outlined in section 5.3.2, this work distinguishes between system relevant and game relevant feedback. The following analysis focuses mainly on the latter. Figure 6.9 shows the learners' voting result and the calculated EMS.

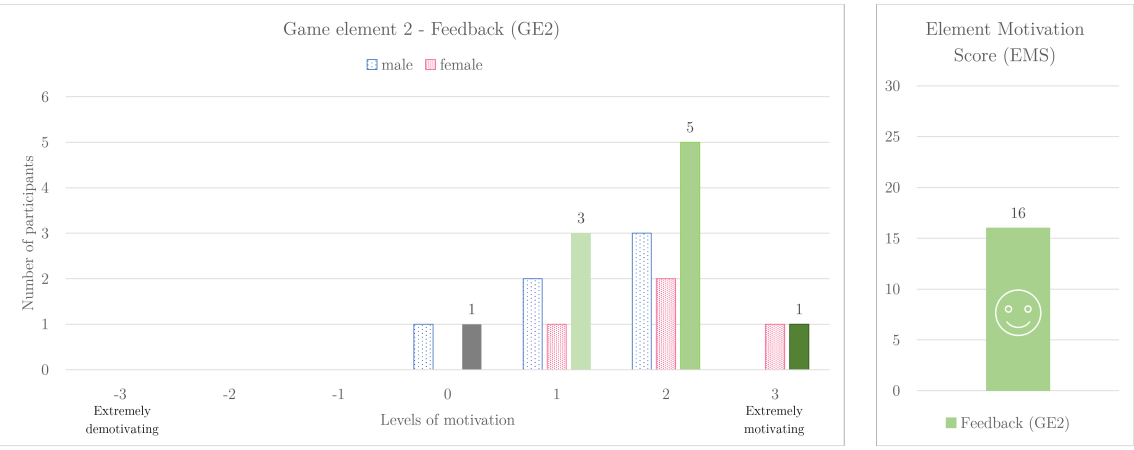


Figure 6.9.: Rating of the game element "Feedback".

The first thing to notice is that no participant indicated a negative rating. Thus, no player was demotivated by this game element. 50 % of the learners gave a rating of 2. Only one female participant was extremely motivated by the game relevant feedback. Not motivated (0) was only one male learner. Participants made the following statements to explain their decision:

Why were you positively motivated/negatively motivated by the "Feedback" game element?

male 1
"It's almost not motivating. You do tasks and "Feedback" doesn't matter."

male 2
"It motivates me well. I like when I see a lot of money."

female 3
"I am very happy when I have a correct answer."

female 2
"[...], it is beautiful."

This game element has a positive effect on the intrinsic motivation of learners. More precisely, the need for competence is satisfied. As the statements show, it motivated the participants when they received feedback about what they achieved when finishing games. To see how much money one had earned was considered encouraging. In addition, the textual and also acoustic feedback in the case of correct solutions triggered positive effects.

This also makes it easier to achieve the so-called "flow state", as mentioned in [38]. If learners are motivated by the feedback that is triggered when correct answers are given, this can lead to new games being started repeatedly in order to achieve this success experience and the good feeling again and again. In this way, the sense of self-forgetfulness and control can arise, which finally lead to the flow state.

Game element 3 - Points, levels and ranking (GE3)

While playing, points are awarded to the learners, which lead to moving up in levels. They can compare themselves with their competitors (colleagues, friends, etc.) by using the leaderboard (post study ranking status see Table 6.6) integrated in the application. These functionalities are summarized as the third game element (GE3) and analyzed in terms of perceived motivation. Figure 6.10 shows the ratings and the resulting EMS for this game element.

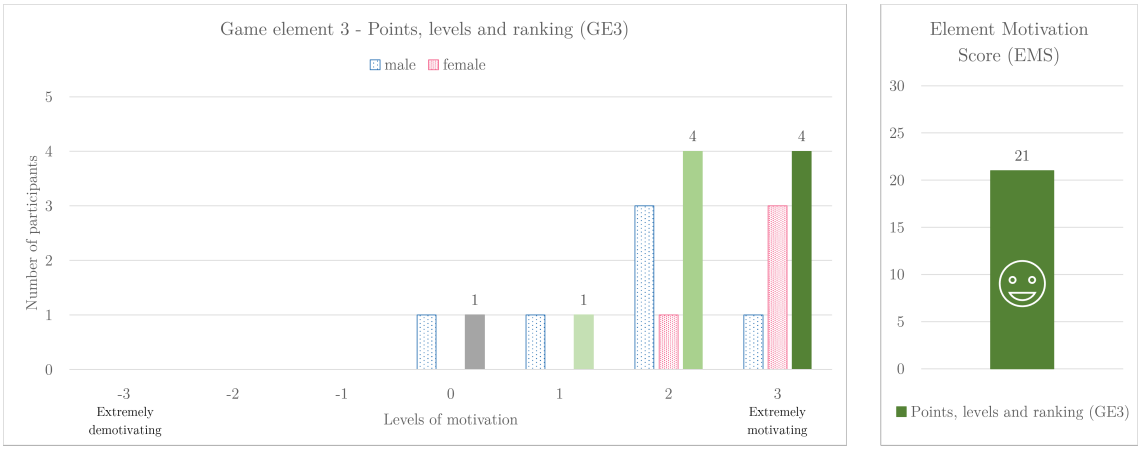


Figure 6.10.: Rating of the game element "Points, levels and ranking".

Eight of the ten participants rated this game element with a motivation score of at least 2. Only one male participant did not perceive this game element as either motivating or demotivating. An enormously positive effect can be observed especially among the female participants. If the EMS of 21 is distributed between the female and male learners, 11 points originate from the females and 10 points from the males. The participants justified their decisions as follows:

Why were you positively motivated/negatively motivated by the "Points, levels and ranking" game element?

male 3
"This motivates me the most. I am now in second place. But I have to reach the first position."

male 2
"Because I can check what level my friends are."

male 1
"Sometimes it can motivate you. But I very rarely pay attention to it."

female 2
"Because I see how good my classmates are."

female 3
"I want to learn a lot of vocabulary and win against my classmates."

From these comments it is evident that competition can have an enormous influence on the motivation towards an activity. In this case, a positive effect was achieved. The learners show more commitment to learning when they can compare themselves with their friends and classmates. It is important for them to see what other players have achieved. Thus, the learners are motivated extrinsically on the one hand, but also intrinsically on the other hand. By competing for the places in the ranking with friends, classmates or other players, the extrinsic motivation type "competition-based" is stimulated. At the same time, this leads to striving for more competence, so that learners will improve in the rankings. As a result, the extrinsic motivation type "competence-based" is also addressed. Further on, this process can also influence the intrinsic motivation, more precisely the striving for competence by oneself. Learners want to achieve more competence in a domain on their own so that they can keep up with their friends and classmates. Nevertheless, one must again distinguish between the "motivational learning modes" [13]. People who belong to the "Learners" type attach less importance to these kinds of competitive game elements. They are mainly intrinsically motivated. For them, it is important to learn a lot of knowledge, but it is irrelevant how they perform compared to others. Types that are more focused on this kind of game elements are "Hybrids" and "Gamers".

Through the process of competing, learners set goals for themselves. This can also be seen from the statements shown above: *"[...] I am now in second place. But I have to reach the first position"*. This in turn can facilitate the achievement of the flow state [38]. As a result, learners play more often, which means that more learning material can be covered and thus more learning goals can be achieved.

Game element 4 - Coins and shop (GE4)

Learners have the opportunity to purchase new avatar items in a store by trading coins they earn while playing. This type of game element, which deals with in-game currency, is rather less explored when dealing with digital learning games, as can be seen from the related work discussed in chapter 4. However, all successful computer and console games today have some sort of virtual currency and an in-game store where players can purchase cosmetic items, XP boosts and more. Consequently, it can be seen that these types of game elements are being integrated into digital games more and more often. Therefore, it is important to study this kind of game element also in the context of educational games. Figure 6.11 shows the perceived motivation of the participants in relation to this game element.

Similar to GE2 and GE3, there are no negative scores. Female learners show more motivation than male learners. The four females awarded in total 9 motivation points, the six males

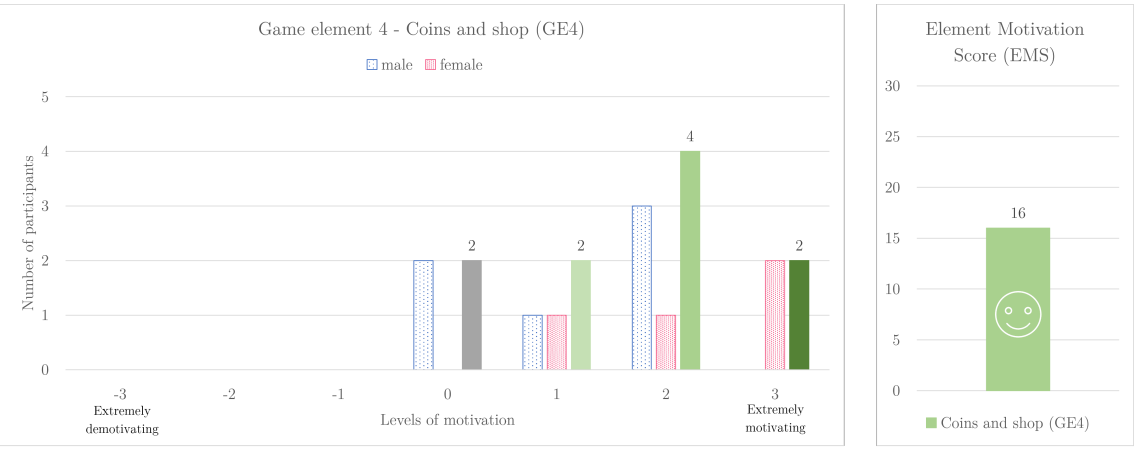


Figure 6.11.: Rating of the game element "Coins and shop".

only 7. Neutral ratings were given by only two participants. The justifications for the ratings given are the following:

Why were you positively motivated/negatively motivated by the "Coins and shop" game element?

male 0
"It neither motivates nor demotivates me. I have already created the perfect avatar for myself."

male 2
"Because I can customize my avatar."

male 0
"I didn't like the options in the store and I wish I could choose the outfit."

female 1
"I don't like it very much because there aren't many options."

female 2
"Because I can make different and funny avatars."

female 3
"Because I make money for this store."

In particular, the statements of the participants who gave rather lower ratings show that either the variety of avatar items was not sufficient or the options were not perceived as attractive enough. Although many learners share this opinion, this game element received a relatively high EMS of 16. Consequently, there is great potential for virtual currencies in combination with an in-game store if players' motivation should be increased towards a digital game.

However, based on the answers, it can also be concluded that avatars alone do not offer enough variety nowadays, so that the motivation of the players decreases. Games for entertainment purposes such as sports games (FIFA), free-to-play games (Fortnite) or even racing games (NFS) offer an enormous range of customizable content. Educational games should follow this approach and offer more customization options. This way, more items can be purchased in the store, which mainly helps to satisfy the need for self-determination and consequently increase intrinsic motivation.

Game element 5 - Duels with time pressure (GE5)

Learners can compete against each other in duels. Winner is the person who needs the least time to "solve" all the terms. This allows to play with friends and classmates. Multiplayer support encourages the competitive spirit, the aim is to win against other players and show that one is better than the opponent. Figure 6.12 shows how the participants perceived this game element.

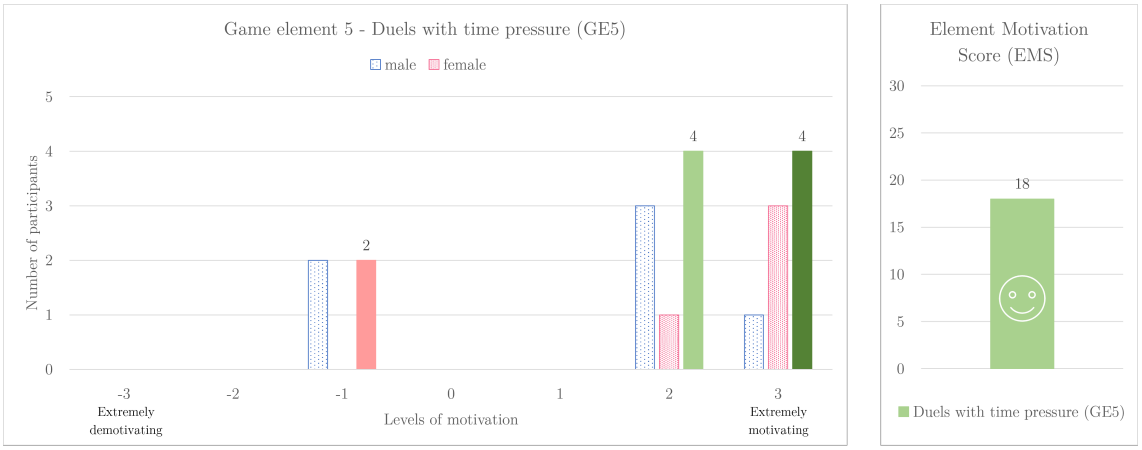


Figure 6.12.: Rating of the game element "Duels with time pressure".

Eight of the ten participants show very strong motivation with regard to the multiplayer feature. However, there are also two males who experienced this game element as demotivating. The trend that game elements have more positive effects on female learners also continues with the game element "Duels with time pressure". The comments given by the learners below explain why a particular assessment was chosen:

Why were you positively motivated/negatively motivated by the "Duels with time pressure" game element?

male 2
"It was nice to organize some contests."

male 3
"It is better than playing alone."

male -1
"I feel demotivated because the multiplayer doesn't work well."

female 3
"I can play with my classmates."

female 2
"Because I can play with my friends."

female 3
"I like to be able to see at the end of a duel which person recognized which words faster."

Participants' statements demonstrate that it is very important for learners to have the opportunity to play with other students. These can be friends or classmates. The organization of competitions among each other addresses the extrinsic motivation type "competition-based". Learners want to win against their friends or classmates to prove that they are better. With regard to intrinsic motivation, the need for social relatedness is triggered. Learners are motivated to play an educational game because it is also played by their friends and thus offers the possibility to learn together. As already addressed in section 5.3.5, the mechanisms employed by digital games for competition go back to social comparison processes [45]. Players love to be able to compare themselves with other players and

are thus motivated to play the game. This can also be confirmed by the following statement: *"I like to be able to see at the end of a duel which person recognized which words faster".*

Nevertheless, two participants perceived demotivation in relation to this game element. According to their statements, they think that the multiplayer function did not work well enough. This shows that different learners have different ideas about how certain game content should be implemented. However, the overall picture shows a clear trend towards positive motivation, which is achieved by the game element "Duels with time pressure".

Game element 6 - Guides and video tutorials (GE6)

In order for a game element to be analyzed in terms of perceived motivation, it must first be ensured that the participants have used these elements in a sufficient number of cases. Through the collected game data, it could be ensured that the functionalities covered by GE1 - GE5 were used sufficiently often to be able to evaluate them meaningfully. In the case of "Guides and video tutorials", it is not possible to tell from the game data whether these were used or not. Therefore, the PostQ question "Did you use the information provided or watch the available videos on how the educational game works?" asked how many participants actually used the guides and video tutorials.

It turns out that only one out of ten learners has taken assistance in this form. Thus, for nine people it is not possible to give a meaningful rating on the motivation scale. Therefore, the EMS for this game element cannot be calculated. Nevertheless, some participants made comments on the topic of "Guides and video tutorials":

Comments

male
"I am positively motivated by "infos" because it is good for people who do not understand how the application works."

male
"The game was quite easy. I had no problems while playing it."

female
"I think students do not need info and tutorials."

Basically, it can be seen that the educational game "Lernen&Spielen" was easy to use. This could also be perceived during the individual sessions, as the participants mostly worked

on their own and without any assistance. Despite all this, every application should include some kind of assistance for those people who have difficulties to cope with the application. Students who already grew up with digital devices and software applications (digital natives) often do not need any assistance when using such programs.

At the end of the PostQ, participants were asked general questions about digital learning. Only half of the learners believe that digital learning games for German would motivate them to learn outside of school. However, seven out of ten are supporting the use of digital learning games in the context of German lessons at school. When asked whether learning games would improve their German language skills or not, one person is not convinced. Six of the ten participants think that learning games improve their language abilities. The remaining three are of neither opinion and cannot say whether learning games can improve their language skills or not. Interesting to see is, that seven of the ten participants would like to use educational games in other school subjects as well.

6.2.4. Teacher interview evaluation

This section is about how the teacher, who was present in all sessions, perceived the lessons with the educational game. The questions asked will be dealt separately.

Q1: What was your impression of teaching with the digital learning game?

The teacher had the impression that the learners had a lot of fun with the learning game. This is also confirmed by the results of the study. In the opinion of the teacher, the learners showed a lot of interest and the lessons went by very quickly. The students were able to discover new teaching methods, which are not often used at school in this form (learning games). Because they could learn through playing, they showed higher motivation and engagement.

The teacher was also very enthusiastic about the fact that everything worked without issues. The equipment (computer, headsets) and the preparations that had to be made in relation to the learning game (accessing the webpage and signing in) worked well and were done quickly.

However, the teacher noted that it is more difficult to help students when they are learning with an educational game than when they are studying with a textbook. Students learn independently and progress differently, which makes it more difficult to provide general assistance compared to exercises in a textbook on which all students are working at the same time. In general, teaching in a GSL class is challenging. Students of different ages and language skills come together. It is difficult to design the lessons in such a way that they are helpful for all participants.

Q2: Do you have any suggestions for improving the educational game?

The teacher expressed that it will be important to include new game variants in the game, which also deal with the topic of grammar. It would be useful to integrate exercises where the learners have to form sentences or match articles to words. In addition, a translation aid would be beneficial, which translates, for example, German words into Ukrainian or Turkish. This way, the learners would not have to use another application for the translation on their own. The teacher thinks that the application has a lot of potential with these extensions.

One could also integrate context-related content. If it is winter, special game variants could be offered that deal specifically with appropriate words for this time of year. In order for the learners and also for the teachers to be able to check the learned language skills, it would be useful to add tests. These could take between 10 to 15 minutes and check certain words learned in different game variations. Afterwards there could be a ranking list where the learners can compare themselves with others and see who did best in this test.

Furthermore, it would be useful to collaborate with teachers when creating educational games. They know best which games (exercises) make sense and improve students' language skills. Therefore, the development should focus more on EDUGAMES than on other forms of learning games.

Q3: Would you continue to use the educational game and recommend it to other teachers?

According to the teacher, the educational game would continue to be used in the classroom and refined in the course of this process. The teacher would also recommend it to other instructors.

The teacher believes that nowadays educators have to deal with this kind of learning methods. The future will bring that students will learn more or less with these techniques. However, these teaching approaches should only support and complement the traditional teaching. Especially in language learning, the interaction of the learners with each other and the independent use of language to communicate with classmates is very important to reach a good level of language competence.

6.3. Discussion

6.3.1. Interpretation and impact

Figure 6.13 summarizes the Element Motivation Scores (EMS) assigned by the participants of the study to the different game elements (GE1 - GE5).

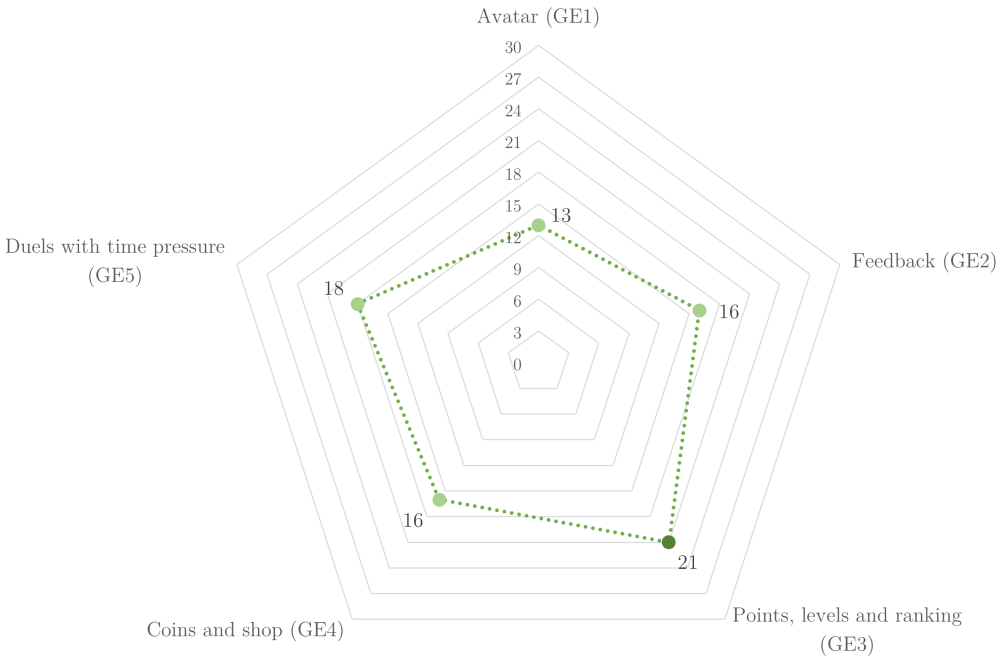


Figure 6.13.: Overview of the Element Motivation Scores (EMS).

The study shows that especially game elements like “Duels with time pressure” and “Points, levels and ranking”, which focus on competition, have an enormous potential to increase the motivation of learners. The possibility to compete directly with other players in a multiplayer mode leads to the fact that the players are extrinsically motivated to play the game. Even more motivating is the ability to compare themselves with friends and classmates via global leaderboards built into the game. This way of competing with other players helps learners to set goals. This motivates them to play the game for a long time.

That the motivation generated by certain game elements also depends on the quality of their implementation is shown by the game elements “Avatar” and “Coins and shop”. The possibility of customization options in a game have increased enormously in the gaming industry over the last few years. As the study shows, an avatar that represents a face

and which can be customized in four areas (head, headgear, eyes and mouth) is no longer sufficient. Today's gamers want to be able to personalize and customize as many things as possible. In order to have a positive impact on intrinsic motivation and to satisfy the need for self-determination, games need to provide a lot of customizable content. The game element "Coins and shop" is of course strongly related to the customizable content that an application provides. Nevertheless, an in-game currency that can be exchanged for items in a store works very well in the area of educational games. Although the learners stated that there were rather few choices in the store, they awarded a total of 16 motivation points for this game element. However, the impact that customizations can have on a learner's motivation towards a game always depends on the individuals themselves. Each player has different preferences and wants different items for his avatar, because they seem meaningful and beautiful to them. How well these game elements can motivate thus depends always on the tastes of the individual persons. Players who like the customization options will be more motivated than learners whose preferences are not met at all.

The game element "Feedback" which permanently informs learners about what they have achieved when completing games increase intrinsic motivation. It satisfies the need for competence by providing visual and auditory feedback to learners when they provide correct answers and complete tasks. This leads to positive experiences states and can result in players playing continuously to relive these states over and over again which eventually leads to the flow state.

The main research question (RQ1) can be answered as follows: Consequently, game elements integrated in a digital learning game which is used in the course of German as a second language instruction have an impact on the motivation and engagement of the participants with regard to the serious task "language learning". If these elements are implemented in an appealing way, they can lead to players being more motivated to learn a language with the help of an educational game. Nevertheless, a certain basic interest and motivation in language learning is required for these elements to have a beneficial influence. This was the case in the considered group of learners, so positive impacts could be achieved.

Based on the study conducted, the semi-structured guideline interview with the teacher and the usability discussions, it can be derived how learners, teachers and parents perceive the use of digital learning games:

Learners

The participants of the study and the two nine-year-old children with whom the usability interviews were conducted showed great interest in learning with an educational game. Seven of the ten students who responded to the PostQ indicated that they were also interested to learn in other school subjects with the help of digital applications. Today's students are able to use digital devices and software applications without any problems. Both the assessment of usability from the learners' point of view and the individual sessions

of the study conducted at school showed that no major assistance is required in terms of how an educational game works. This indicates that today's students, who have already grown up with digital devices, software programs and the Internet, are digital natives. They are ready to use new learning technologies in the classroom.

Teachers

The semi-structured guideline interview conducted with the teacher who is responsible for teaching GSL provided insights into how teachers think about the use of digital games in the classroom. Additional information could be gained by testing the learning game in terms of usability from the teachers' point of view. It turns out that digital learning games are also becoming more and more interesting for teachers. As children and thus learners use digital devices more frequently in their daily lives, it is becoming increasingly important from the perspective of teachers to incorporate this type of learning into the classroom. However, traditional teaching should only be supported by these methods and not completely replaced. It brings a nice variation to the learning with traditional textbooks and worksheets. The teachers are convinced that educational games can have an influence on the motivation of students with regard to learning.

Parents

They also showed no aversion to educational games. Parents also know that digital devices and digital games are becoming increasingly important in children's lives. At the latest since the release of smartphones, digital devices have become an essential part of many kids' lives. But adults themselves are also showing interest in the use of educational games. The two parents who were present during the usability test stated that they could imagine learning with educational games. Because neither of them speaks German, they were also very interested in the learning game "Lernen&Spielen" from a personal point of view. Teachers also indicated that more and more parents are contacting them to ask for digital educational games that their children can use for learning at home.

Regarding research question RQ2 a trend change can bee seen. Through the interviews and the study conducted, it appears that not only learners but also teachers and parents have a positive attitude towards digital educational games and their use in schools. This is somewhat surprising, since digital games and the video game industry in general were heavily criticized especially by parents just a few years ago.

6.3.2. Limitations of the work

Despite the interesting results, the conducted study shows some limitations. The group of students considered corresponds exactly to the target group, as they are refugee children who are now settling in Austria and inevitably have to learn the German language. For this purpose, they attend the GSL lessons, in which the learning game "Lernen&Spielen" was applied in the context of the study. Nevertheless, with eleven participants, the group size is

rather small. In order to substantiate the results, it would be useful to test the learning game or an extended version of it in several groups and compare the results with regard to the perceived motivation. However, it has been shown in the course of this work that finding partner schools or learning groups that would be willing to participate in such a study is more difficult than expected. With regard to the usability tests, a higher number of participants would be useful in order to obtain more meaningful results. In addition, more specific tests should be conducted, so that not only the general usability of the system is determined, but also specific problems in the learning game can be identified and improved to further optimize the user friendliness.

It is also difficult to measure how integrated game elements influence the motivation of learners. The approach of a motivation scale in combination with the possibility to state in own words why game elements were perceived as motivating/demotivating was considered useful. Literature does not show a standardized approach for the evaluation of game elements in terms of perceived motivation. Further research could possibly be conducted in this area in order to attempt a standardized evaluation method.

Chapter 7

7. Conclusion and further research possibilities

7.1. Conclusion

Gamification elements integrated into a digital learning game used in the context of German as a second language instruction have an impact on the motivation and engagement of the participants in relation to the serious task of "language learning". Game elements such as "duels with time pressure" and "points, levels and leaderboards" were identified as the most motivating ones. These types of gamification elements focus on competition by allowing learners to compete in head-to-head duels or to compare themselves with friends or classmates using leaderboards. This increases extrinsic motivation with regard to the learning game by addressing the "competition-based" motivation type. In addition, intrinsic motivation can be produced by striving for more competence in order to keep up with friends or classmates. Learners thus set goals for themselves, which can lead to reaching the so-called "flow state", causes them to play more and thus increases the learning effect.

Constant "feedback" through the application helps learners follow the progress of the game. They receive information about what they have achieved by completing different games. This can satisfy the need for competence by praising users for completing games or giving correct answers.

Game elements that rely on customization, such as "Avatar" and "Coins and store" are strongly dependent on each other. It has been shown that avatars that represent a face which can be customized in four areas (head, headgear, eyes and mouth) are no longer enough to motivate players. Nowadays it is important to provide as much customizable content as possible. Like video games for entertainment purposes, such as FIFA or WoW, educational games need to provide a wide range of areas that can be personalized or customized by the players. However, it should also be noted that the influence that customization can have on the motivation of learners is always dependent on the learners themselves. If they don't like the customization options for their avatars, they will probably ignore these game elements.

Although in-game currency combined with a shop is not often integrated into learning games and therefore has not been studied most in the literature for its impact on learners' engagement, this work shows that these gamification elements have great potential to

positively influence motivation. Players are happy when they earn coins that they can then spend in the shop on things to represent themselves in the game. The need for self-determination is satisfied and thus they perceive intrinsic motivation towards the learning game. Additionally, items that are purchased for a lot of money in the store can convey prestige and thus increase extrinsic motivation. As already mentioned, the range of things that can be bought in the store must be sufficiently large to be able to achieve positive effects.

It is also shown that not only students but also their parents and teachers have a positive attitude towards educational games. This is surprising, since just a few years ago digital games of all kinds were viewed rather critically, especially by parents. Today's learners, who have already grown up with digital devices and games, show great interest in learning with educational games. Furthermore, they have no problems using such applications because they are already digital natives. This leads to the fact that teachers are also convinced that sooner or later new instruction methods, such as learning with digital devices, will support traditional teaching. This means that schools and in particular teachers should take a closer look at this topic. Parents more often ask teachers about digital learning games so that their children can practice certain things at home in a playful way. However, digital learning games could be interesting not only for their children but also for themselves, as seen by the two parents who were present during the usability interviews conducted with their children as part of the study who stated that they could imagine learning German with such learning games.

7.2. Further research possibilities

The related work considered in this paper shows that research on digital educational games is being conducted in many directions. Due to the increasing interest of teachers, parents and students in educational games, the number of papers on this topic will most likely continue to grow in the coming years.

Based on this thesis, many further works are possible. Thus, the learning game "Lernen&Spielen" could be further developed based on the results of this work. It is possible to add further game variants, which include grammar exercises or the formation of sentences. Additional game variants that focus on further language learning exercises were desired by many participants of the study. Here it would be possible to work specifically together with teachers to develop the educational game in the direction of an EDUGAME. With the previously mentioned improvements, the learning game could be used in several GLS classes. In addition to assessing the impact of the integrated game elements on the learners' motivation, it could be investigated whether the learning game can achieve better learning outcomes than pure traditional teaching.

An additional study focused exclusively on investigating usability issues of the application would be useful to further improve the educational game in terms of user friendliness.

Through the monitoring of GLS lessons in the traditional form, it has been noticed that a lot of learning is done with worksheets, which have to be managed independently by the students, as often learning resources in the form of textbooks are not available for all participants. Taking up this problem, it would be possible to think about implementing a teaching platform that makes it possible to distribute assignment sheets to students online and reduce the organizational effort. Further, the motivation of students could be increased with integrated games and gamification elements, as considered in this work. It could be a kind of an online platform that supports traditional teaching in terms of organization and additionally integrates modern teaching methods by adding game elements. In this way it would be possible to combine traditional with modern teaching techniques in a nice manner. Implementation could be done in collaboration with teachers and students so that the needs of both target groups can be met as best as possible. Content for implemented games might be added dynamically by teachers so that material just covered is addressed by the games. Traditional worksheets that have been worked on could be submitted online by the students so that they can be checked more easily by the teachers. Prototypes might be used to conduct studies in different GSL classes to determine whether such a platform will usefully support traditional teaching and make learning more interesting with additional integrated games so that learners are more motivated.

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A. Appendix

A.1 Think aloud - Scenarios

Represents the scenarios that were processed during the usability interviews from the perspectives of learners and teachers using the learning game “Lernen&Spielen”.

A.2 Guidance for teachers

This document has been made available to teachers so that they can get an impression of the learning game. It describes the functions and game variants that are implemented and which requirements exist so that the educational game can be used successfully in class.

A.3 Pre-Fragebogen / A.4 Pre-questionnaire

Is the questionnaire that the participants completed before the study started. It includes single-choice, multiple-choice and open question. The purpose of this questionnaire was to determine how the study participants use digital devices as well as how they currently learn German and whether they also use digital learning games in this context.

A.5 Post-Fragebogen / A.6 Post-questionnaire

Is the questionnaire which was answered by the participants at the end of the study. In addition to single-choice, multiple-choice and open questions, it also contains the answer option “scale rating”. This questionnaire was used to find out how the learning game “Lernen&Spielen” was perceived by the learners. In particular, it was determined how the integrated game elements influenced the learners’ motivation.

A.7 Pre-questionnaire evaluation summary

Shows the results collected through the pre-questionnaire in the course of the study. Participants’ responses to open questions are not included in this table due to space limitations.

A.8 Post-questionnaire evaluation summary

Shows the results collected through the post-questionnaire in the course of the study. Participants’ responses to open questions are not included in this table due to space limitations.

A.1. Think aloud - Scenarios

User group **Learners**

Starting situation

You are a student in a German language class at a high school in Vienna. Your teacher decides to use a new learning game “Lernen&Spielen” as part of the lesson. At the beginning, you try to get an overview of the application. In doing so, you complete the following tasks.

Task 1 - Learners	T1-LE
Task: Start a **memory game** with a **random card set** at **level 2** and finish the game successfully. After completing the game, switch to the game overview page (start page).	
Problems	**Time needed**

Task 2 - Learners	T2-LE
Task: Start a "**Bilderrätsel"** game in mode "**Schreiben"** with the card set "Finde das richtige Obst!". After successfully completing the card set, switch to the game overview page (start page).	
Problems	**Time needed**

Task 3 - Learners	T3-LE
Task: **Buy** a **new item** for your **avatar** with the **coins** you have earned so far. After the purchase, **change your avatar** to **wear** the **newly purchased item**. Then go to the game overview page (start page).	
Problems	**Time needed**

Task 4 - Learners	T4-LE
Task: **Change** the **voice** that the application uses for communication to another **voice of your choice,** if possible. **Additionally**, **disable "automatic help"** (**Automatische akustische Hilfestellungen)** which is provided when you press the "memory button", for example. After that, switch to the game overview page (start page).	
Problems	**Time needed**

Task 5 - Learners	T5-LE
Task: Have a look at the **global leaderboard** to see the trophies, points, coins, etc. you have earned so far. There you can compare yourself with all other registered users. In addition, **change the criterion for the ranking** from "**Exp**" to "**coins**" (**Münzen**). After that, switch to the game overview page (start page).	
Problems	**Time needed**

User group **Teachers**

Starting situation

As a teacher for German you have heard about a new learning game "Lernen&Spielen". You have decided to use it in your classroom. After using the game in class for a week, you decide to take a closer look at the game from a teacher's perspective. In doing so, you perform the following tasks.

Task 1 - Teachers	T1-TE
Task: Get an **overview of the achievements** of the registered students in the **global ranking**. Here you **can see how many card sets** each **student has successfully completed** in each game mode (all the terms of the card set correctly recognized). **Name the student** who has **completed the most sets of cards** in **Memory Mode - Level 2** (**Silver cup**). Then go back to the game overview page (start page).	
Problems	**Time needed**

Task 2 - Teachers	T2-TE
Task: You decide to **create new content** to give students a chance to practice terms you specifically added. You **first add two new cards**, one representing the **term "Qualle"** (Jellyfish) and the other one representing **the term "Ratte" (Rat)**. Once the two cards show up in the overview, the task is complete.	
Problems	**Time needed**

Task 3 - Teachers	T3-TE
Task: Next, you will **create a new set of cards** called "**Klasse 2A – Tiere 1**". This set of cards should consist of **terms** that **represent animals**. In total, **it should contain six cards** (terms). From all available cards, **you choose one of your two previously added terms** and **five terms** that **already exist in the application**. The task is finished as soon as the set of cards appears in the overview.	
Problems	**Time needed**

Task 4 - Teachers	T4-TE
Task: **You** have **decided** on short notice **to integrate your second added term** in the **card set** you **just created**. To do this, you **edit the card set** and **replace a term of your choice** with the term you added earlier. In the end**, the card set should contain four terms that already exist** in the application **and your two previously added terms**. After successful editing you will switch to the game overview page (start page).	
Problems	**Time needed**

Task 5 - Teachers	T5-TE
Task: To **verify that** the **card set** you just created **can** actually **be played** by the students, you **choose any game mode and select that card set for playing**. After successful completion of the card set in the selected mode, you switch back to the game overview page (start page).	
Problems	**Time needed**

A.2. Guidance for teachers

universität wien

L&S

Lernen&Spielen

Anleitung für Lehrpersonen

Inhaltsverzeichnis

1. Einleitung

Mithilfe des Lernspiels „Lernen&Spielen“ soll die Motivation und das Engagement der Teilnehmer/innen sogenannter DaZ-Klassen (Deutsch als Zweitsprache) in Hinblick auf das Deutschlernen gesteigert werden. Das Spiel enthält zwei Spielmodi, welche dahingehend programmiert wurden, dass Lernende die Bedeutung, Aussprache und Schreibweise deutscher Begriffe spielerisch erlernen können. Jedoch soll mithilfe der durchzuführenden Studie genauer analysiert werden, ob die integrierten Spielelemente (Avatare, Punkte, Level usw.) positive Auswirkungen auf die Motivation der Schüler/innen haben. Ob der Einsatz des Lernspiels auch zu einer signifikanten Verbesserung in Bezug auf die Deutschkenntnisse der Studienteilnehmer/innen führt ist nicht Hauptaspekt der Studie.

Dieses Dokument ist speziell für Lehrpersonen und liefert einen Überblick über alle Funktionalitäten des Lernspiels. Es kann bei auftretenden Schwierigkeiten als Handbuch verwendet werden, um Lösungen für etwaige Probleme nachzuschlagen. Zusätzlich können sich Lehrpersonen einen allgemeinen Überblick über das Spiel verschaffen.

Das Lernspiel kann über die URL - https://lernenundspielen-f1587.web.app/ erreicht werden. Lehrpersonen ist es jederzeit gestattet einen Account zu erstellen und die Applikation selbständig zu erforschen.

2. Anforderung für die Verwendung der Applikation

In den nachfolgenden Aufzählungen und Tabellen wird ein Überblick darüber gegeben, was benötigt wird damit die Applikation sinnvoll im Unterricht eingesetzt werden kann.

Checkliste – Nötige Ausstattung

- Ein **internetfähiges Gerät** wie z.B. Smartphone, Laptop, Desktop-PC oder Tablet muss für jede an der Studie teilnehmende Person bereitgestellt werden.
- Ein **Web-Browser** (Chrome, Microsoft-Edge usw.) muss auf dem Gerät vorinstalliert sein, um den Zugriff auf die Applikation zu gewährleisten.
    - *Wenn möglich kein Mozilla **Firefox**, da dieser keine Spracheingabe unterstützt!*
- Jedes verwendete Gerät sollte **die Möglichkeit der Spracheingabe** bieten. Während Smartphones, Tablets und auch die meisten Laptops bereits standardmäßig Mikrofone für diesen Zweck integriert haben, kann es sein, dass bei Desktop-PCs zusätzliche Eingabegeräte (z.B. Mikrofon oder Headsets) bereitgestellt werden müssen.

Checkliste – Durchzuführende Schritte vor dem Einsatz der App (Konfiguration)

- Jeder Teilnehmer/Jede Teilnehmerin benötigt einen **Account**, um alle Funktionalitäten des Tools nutzen zu können. Vor jeder Sitzung muss geprüft werden, dass jeder Teilnehmer/jede Teilnehmerin mit **seinem/ihrem Account angemeldet ist**.
    - Beim Anlegen des Accounts müssen Benutzer/innen folgende Daten angeben: **E-Mail-Adresse** (kann eine fiktive sein z.B.: user1@studie.at), **Vorname**, **Nachname**, **Geschlecht**, **Geburtsdatum** und ein **Passwort**. Diese persönlichen Daten der Teilnehmer/innen sind einerseits für eine sinnvolle Nutzung der App Voraussetzung, andererseits wichtig für statistische Auswertungen im Rahmen der Studie (prozentualer Anteil von männlichen/weiblichen Teilnehmer/innen usw.).
    - Diese Accounts können entweder in der ersten Sitzung von den teilnehmenden Personen selbständig angelegt werden oder bereits im Vorfeld der Studie, wenn alle benötigten Daten bekannt sind und verwendet werden dürfen.
- Sollte der Browser-Cache zwischen den Sitzungen auf den verwendeten Geräten nicht gelöscht werden und keine aktive Abmeldung durch den Benutzer/die Benutzerin erfolgen, sollten die Teilnehmer/innen angemeldet bleiben und kein erneutes Login notwendig sein! (Jeder Teilnehmer/Jede Teilnehmerin benötigt dasselbe Gerät der letzten Sitzung)
- Sollte die Spracheingabe eventuell nicht funktionieren, muss diese zuerst über den Web-Browser aktiviert werden.
- Beim Bestreiten von Multiplayer-Spielen (Duelle zwischen zwei Benutzer/innen) werden Benachrichtigungen versendet. Diese Benachrichtigungen müssen eventuell zuerst über den Browser „erlaubt“ werden.

Zusammenfassung/Übersicht					
Verwendetes Gerät					
	Smartphone	Laptop	Desktop-PC	Tablet	
Sprachausgabe	✓	✓	*Zusätzliche Ausgabegräte (Lautsprecher) notwendig!*	✓	
Spracheingabe	✓	✓	*Zusätzliche Eingabegeräte (Mikrofone) notwendig!*	✓	
Anzahl Wiedergabestimmen	wenig	mehr	mehr	wenig	
Verwendeter Browser					
	Google Chrome	Microsoft Edge	Mozilla Firefox	Safari	Weitere ...
Spielmodi - Memory					
Level 1	✓	✓	✓	✓	*nicht getestet*
Level 2	✓	✓	✓	✓	*nicht getestet*
Level 3	✓	✓	✓	✓	*nicht getestet*
Spielmodi - Bilderrätsel					
Schreiben	✓	✓	✓	✓	*nicht getestet*
Sprechen	✓	✓	✗	✓	*nicht getestet*

Angemeldet vs. Gastbenutzer			
	Angemeldet	**Gastbenutzer**	
Änderung der Wiedergabestimme (Einstellungen)	✓	✓	
Hinzufügen neuer Spielinhalte (Karten und Kartensätze)	✓	✗	
Speicherung des Spielfortschritts	✓	− Erhaltene Trophäen werden lokal im Browser-Cache gespeichert (**keine persistente Speicherung**)	
Spielelemente/Gamification-Elemente *(Zur Steigerung der Motivation)*			
Avatar	✓	✗	
Erfahrungspunkte, Level und Ranglisten	✓	✗	
Trophäen	✓	✓	
Münzen und Shop	✓	✗	
Feedback	✓	− Nur sehr eingeschränkt!	
Duelle (mit Zeitdruck)	✓	✗	
Hilfestellungen und Video-Tutorials	✓	✓	
Erstellt am 06.09.2022			

Empfohlene Ausstattung und Konfiguration

Gerät: Smartphone

Am einfachsten wäre die Verwendung des eigenen Smartphones. Somit ist sichergestellt, dass jede Person immer das gleiche Gerät verwendet, womit durch den Browser gespeicherte Daten wiederverwendet werden können bzw. Benutzer/innen automatisch angemeldet bleiben. Außerdem ermöglicht dies, dass die Applikation auch zu Hause, außerhalb des Unterrichts, benutzt werden kann.

Die Testung der Applikation erfolgte weitestgehend auf Smartphones und Laptops. Etwaige Darstellungsprobleme können auf einem Tablet nicht zur Gänze ausgeschlossen werden.

Browser: Google Chrome

Der Einsatz von Google Chrome als Web-Browser wird empfohlen. Viele Browser unterstützen gewisse Funktionalitäten nicht oder nur in einer bestimmten Art und Weise. Um Komplikationen dieser Art völlig ausschließen zu können sollte Google Chrome (**aktuelle Version!**) verwendet werden, da die Testungen des Lernspiels vor allem mithilfe dieses Browsers erfolgten.

Benutzerstatus: Angemeldet

Um sinnvolle Ergebnisse aus der Studie extrahieren zu können, welche dann in der zu schreibenden Arbeit integriert werden, muss stehts sichergestellt werden, dass alle teilnehmenden Personen bei der Verwendung der Applikation mit ihrem PERSÖNLICHEN ACCOUNT angemeldet sind. Damit erhalten sie nicht nur Zugriff auf die wichtigen Spielelemente, sondern der Spielfortschritt aller Personen wird persistent gespeichert und kann so zu einem späteren Zeitpunkt abgerufen und analysiert werden.

3. Spielmodi und Anwendungsmöglichkeiten

Das Lernspiel beinhaltet zwei Spielmodi, „Memory“ und „Bilderrätsel“. Zusätzlich können zwei Spieler/innen mittels integrierter Multiplayer-Funktion gegeneinander antreten. Duelle erfolgen im Modus „Bilderrätsel“ und enthalten zusätzliche Spielelemente. Alle Spielmodi werden mit Karten bzw. Kartensätze gespielt, wobei jeweils eine Karte einem deutschen Begriff entspricht. Nachfolgend werden die einzelnen Spielvarianten genauer beschrieben, wobei genauer auf den Ablauf und das Lernziel dieser eingegangen wird.

Memory

Ablauf – Dieser Spielmodus funktioniert im Grunde genommen wie ein klassisches Memory-Spiel. Die spielende Person muss alle passenden Kartenpaare des gewählten Kartensatzes finden. Eine Karte stellt einen deutschen Begriff dar. Der Unterschied zu einem klassischen Memory-Spiel ist jedoch, dass neben Bildern auch die Schreibweise und Aussprache der Begriffe zum Einsatz kommen.

Lernziel – Der Spielmodus dient dazu den Lernenden bestimmte Begriffe und dessen Bedeutungen näher zu bringen. Es gibt drei verschiedene Level (Level 1, Level 2, Level 3) aus denen gewählt werden kann. Durch die unterschiedlichen Level verändert sich, wie ein Begriff auf den Karten dargestellt wird.

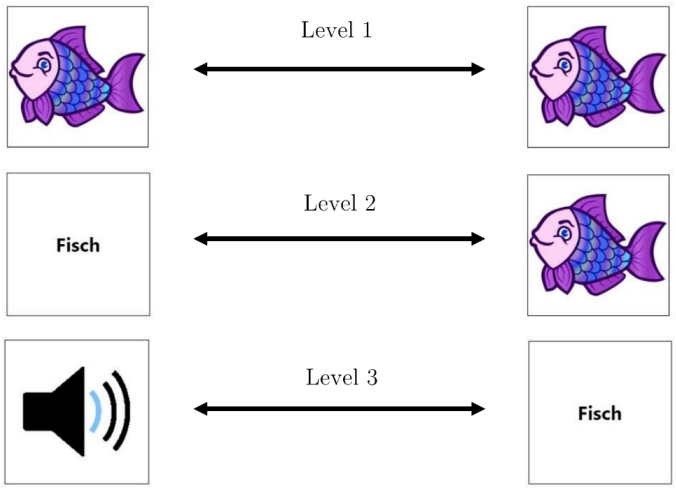


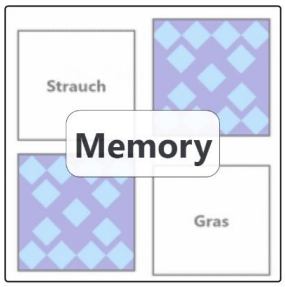
Abbildung 1: Darstellung eines Begriffs in den unterschiedlichen Levels.

In Abbildung 1 wird gezeigt, wie sich ein Kartenpaar in den unterschiedlichen Levels zusammensetzt. Die drei Level sind folgendermaßen aufgebaut:

- **Level 1:** Da es in diesem Level darum geht die Bedeutung verschiedener Begriffe zu verstehen, zeigen beide Karten eines passenden Kartenpaares das identische Bild. Zusätzlich sprechen die Karten das jeweils repräsentierte Wort vor. Dieser Level stellt somit das klassische Memoryspiel dar und erweitert dieses mit der zusätzlichen Funktion der akustischen Wiedergabe.
- **Level 2:** Eine Karte zeigt das geschriebene Wort und spricht auch den Begriff. Die passende Partnerkarte zeigt wiederum ein Bild. Nachdem in Level 1 die Bedeutung der Begriffe kennengelernt wurde, wird in Level 2 zusätzlich auf die Schreibweise wertgelegt. Durch das Vorsprechen des Begriffs ist aber auch möglich richtige Kartenpaare zu finden, wenn die Schreibweise des Wortes noch nicht bekannt ist.
- **Level 3:** Dieser Level verwendet keine Bilder mehr. Lernende müssen bereits mit der Aussprache und Schreibweise des Begriffs vertraut sein, um passende Kartenpaare finden zu können. Eine Karte spricht den Begriff, wobei die Partnerkarte das geschriebene Wort zeigt.

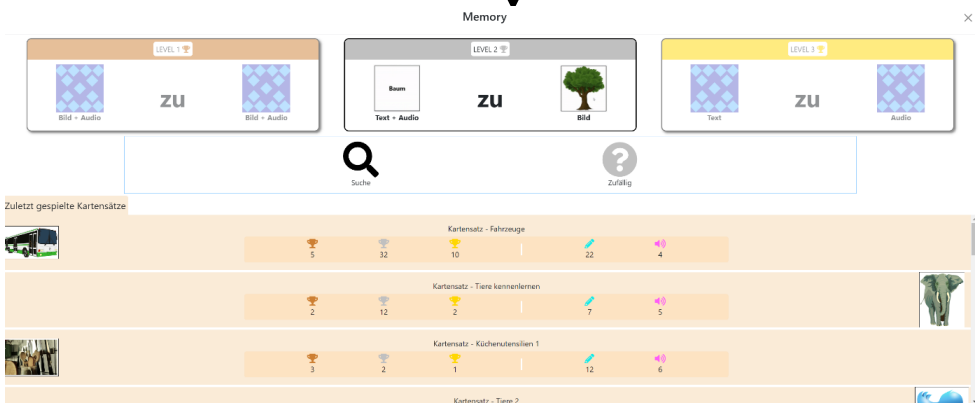
Die drei Level sind aufeinander aufbauend und es wird empfohlen diese sequenziell pro Kartensatz durchzuspielen (Es ist aber **nicht verpflichtend!**).

Memory – Ein Beispiel



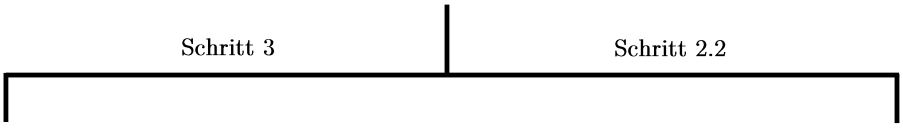
Schritt 1: Betätigen des Memory-Buttons auf der Spielübersichtsseite (Startseite).

Öffnet Konfigurationsfenster

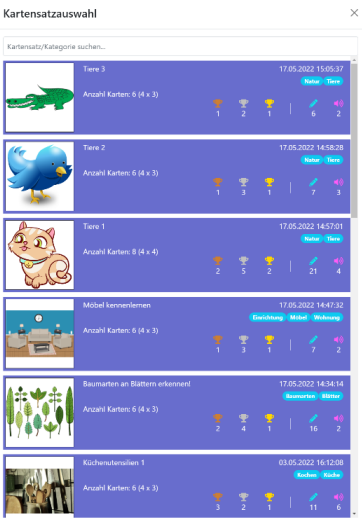


Schritt 2: Auswahl eines Levels über die Level-Button (Bronze – Level 1, Silber – Level 2, Gold – Level 3). Danach gibt es drei unterschiedliche Möglichkeiten einen Kartensatz auszuwählen, welcher für das Memory-Spiel verwendet werden soll:

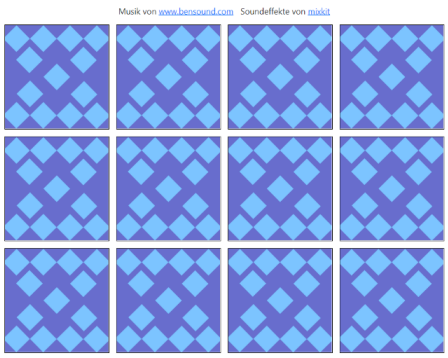
1. Zufällig (Fragezeichen-Button): Es wird ein Spiel mit einem zufällig gewählten Kartensatz gestartet.
2. Suche (Lupe-Button): Öffnet ein weiteres Fenster, wo gezielt nach einem bestimmten Kartensatz gesucht werden kann (siehe **Schritt 2.2**).
3. Zuletzt gespielte Kartensätze (Liste): Durch einen Klick auf einen Kartensatz in der Liste wird ein Memory-Spiel mit den Karten dieses Kartensatzes gestartet. Wie der Name bereits vermuten lässt, werden hier alle gespielten Kartensätze gelistet und zwar absteigend nach Datum des Spielens (beginnend mit dem zuletzt gespielten).



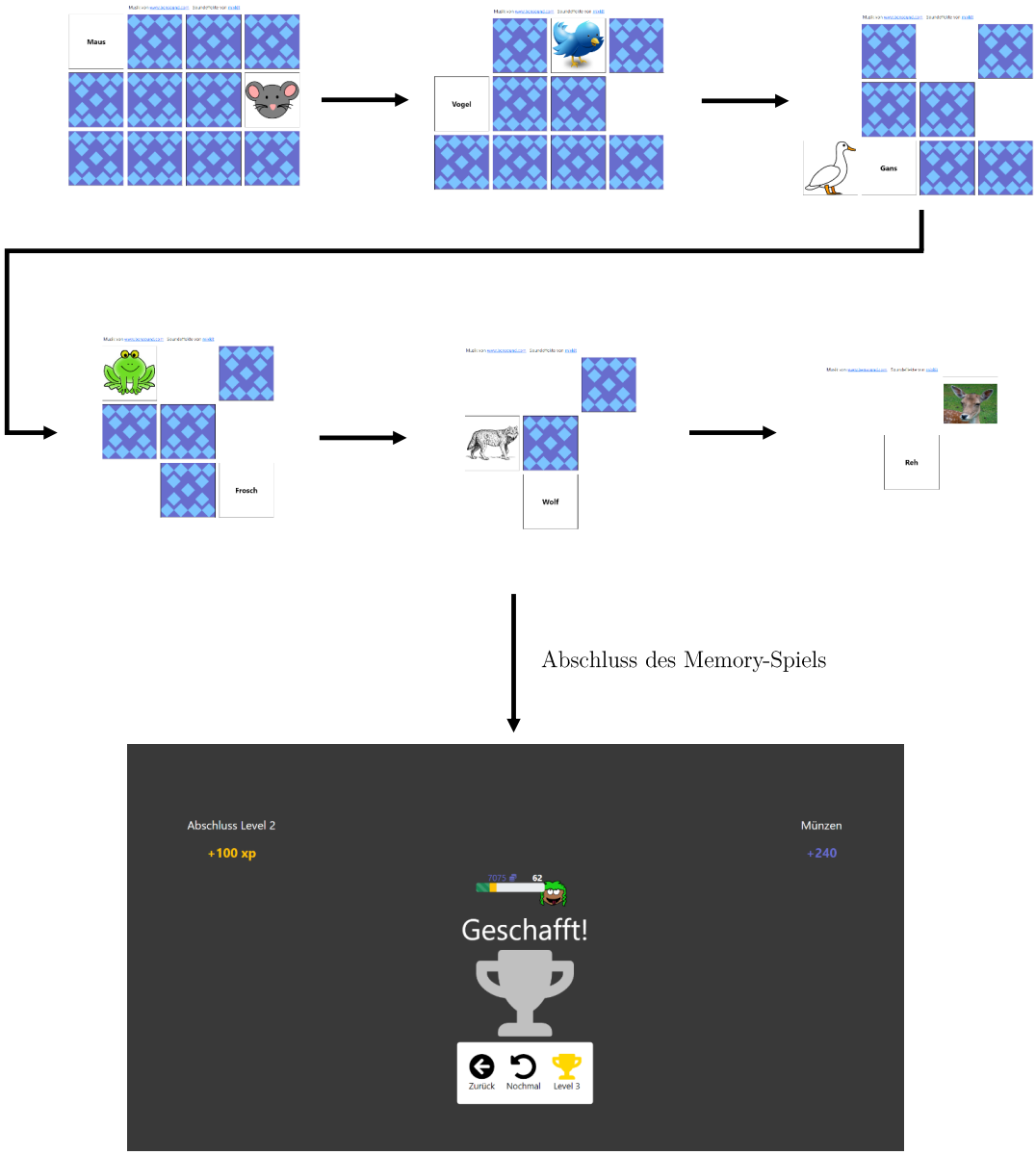
Schritt 2.2: Suchen eines Kartensatzes.



Schritt 2.2: Über die Suchleiste kann entweder nach Namen oder Kategorien von Kartensätzen gesucht werden. Mit einem Klick auf den gewünschten Kartensatz wird das Spiel mit diesem gestartet.



Schritt 3: Spielen (Finden von Kartenpaaren). Alle Karten des Kartensatzes werden mit der Rückseite nach oben dargestellt. Die spielende Person kann mit einem Klick auf eine Karte diese auf die Bildseite drehen und so beginnen die passenden Kartenpaare zu suchen.



Schritt 4: Abschluss des Kartensatzes im Modus „Memory“. Es werden die erhalten XP gezeigt und direkt zum aktuellen Charakter-Level addiert (siehe Fortschrittsbalken). Außerdem werden die in diesem Spieldurchlauf verdienten Münzen dargestellt. Von dieser Ansicht aus kann entweder zur Spielübersichtsseite („Pfeil nach links“-Button) gewechselt werden oder dieser Kartensatz im selben Level nochmals („Pfeil Kreis“-Button) oder einen Level höher („Pokal“-Button) gespielt werden.

Bilderrätsel

Ablauf – Bei dieser Spielvariante kann sich eine Person zwischen den Spielmodi „Sprechen“ und „Schreiben“ entscheiden. Beim „Sprechen“ muss ein Begriff, welcher durch ein Bild illustriert wird, durch Spracheingabe richtig benannt werden. Im Modus „Schreiben“ soll ein per Bild dargestelltes Wort richtig geschrieben werden, indem die Buchstaben, welche in zufälliger Reihenfolge dargestellt sind, richtig angeordnet werden (siehe Abbildung 2).

Lernziel – Durch diese Spielvariante soll genauer das Sprechen bzw. Schreiben von Begriffen trainiert werden. Es wird empfohlen einen Kartensatz erst in diesem Modus zu spielen, wenn dieser bereits im Modus „Memory“ erfolgreich durchgespielt wurde. Es ist von Vorteil, wenn die Begriffe und deren Bedeutungen bereits bekannt sind.

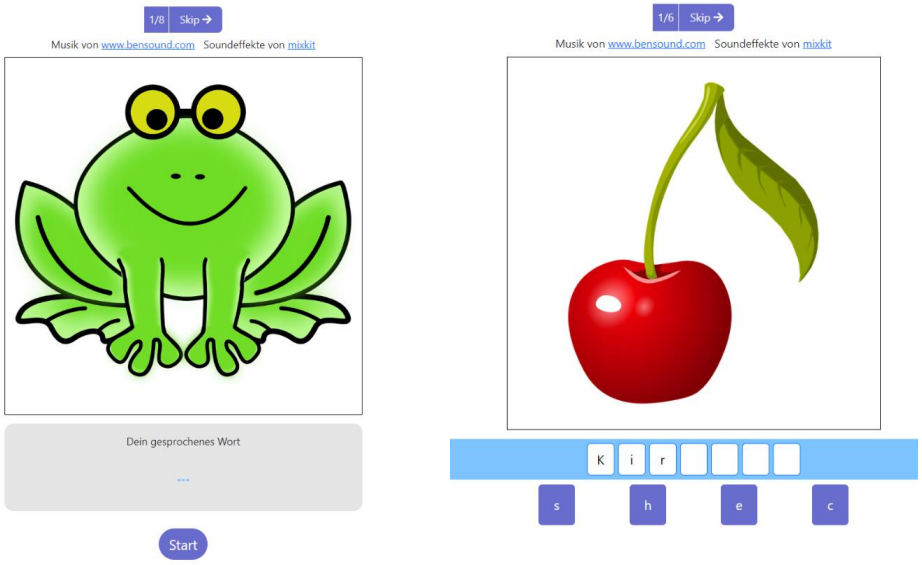


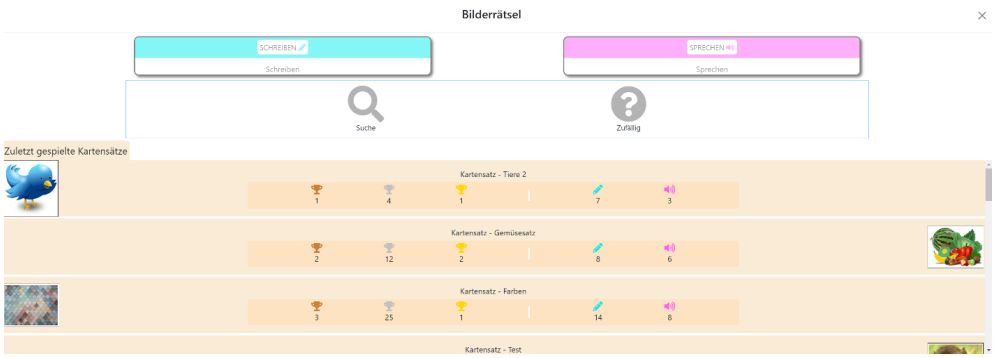
Abbildung 2: Die Spielmodi „Sprechen“ und „Schreiben“ im Überblick.

Der „Skip“-Button, welcher in beiden Spielmodi existiert (siehe Abbildung 2), kann dazu verwendet werden, um nicht bekannte Begriffe zu überspringen. Dabei ist zu beachten, dass bei der Betätigung dieser Schaltfläche später nicht mehr zu diesem Begriff zurück gewechselt werden kann und ein „erfolgreicher“ Abschluss des Kartensatzes (Verleihung einer Trophäe und Vergabe von Erfahrungspunkten) nicht möglich ist. Damit XP und eine Trophäe vergeben werden können, müssen alle Begriffe des Kartensatzes richtig „gelöst“ werden, d.h. der „Skip“-Button darf in diesem Durchlauf nicht verwendet werden.

Bilderrätsel – Ein Beispiel

Schritt 1: Betätigen des Bilderrätsel-Buttons auf der Spielübersichtsseite (Startseite).

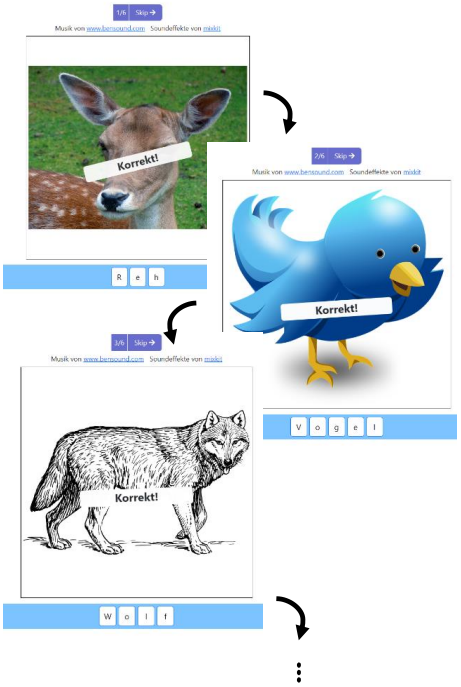
Öffnet Konfigurationsfenster



Schritt 2: Auswahl des Spielmodus über die „Modus"-Button (Türkis – Schreiben, Lila – Sprechen). Danach gibt es drei unterschiedliche Möglichkeiten einen Kartensatz auszuwählen, welcher für das Bilderrätsel-Spiel verwendet werden soll. Der Auswahlvorgang eines Kartensatzes ist ident zu jenem im Memory-Modus und kann dort nachgeschlagen werden (**Schritt 2** und **Schritt 2.2** im Abschnitt **Memory – Ein Beispiel**).

Schritt 3

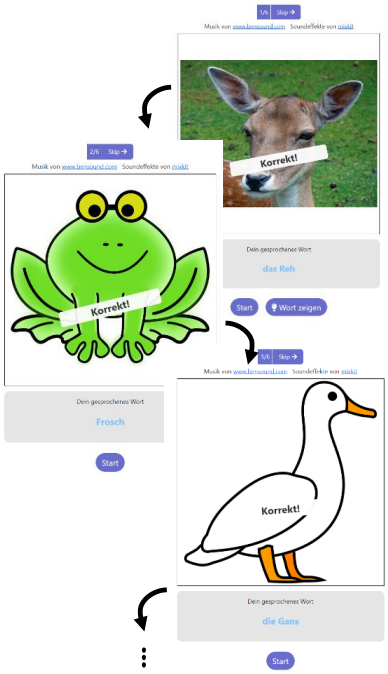
Schritt 3: Spielen des Modus „Schreiben“



Beim Schreiben müssen die Buchstaben in die richtige Reihenfolge gebracht werden.

Tipp: Der Anfangsbuchstabe des gesuchten Begriffs wird immer als Großbuchstabe angezeigt.

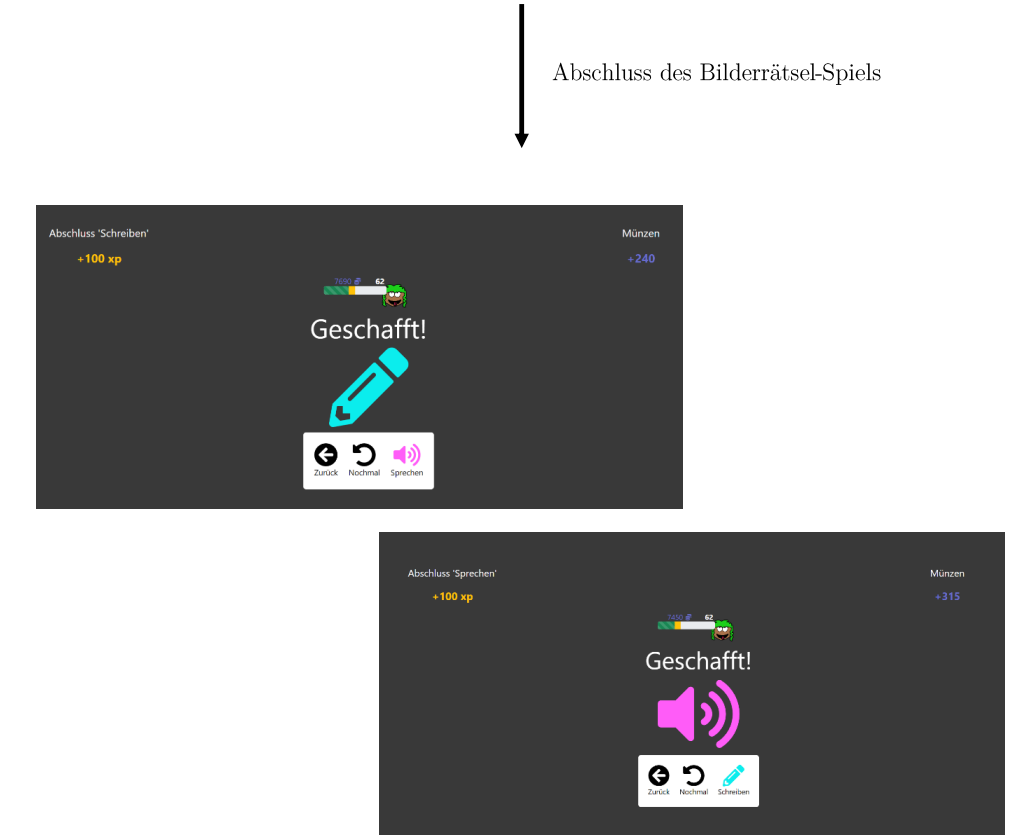
Schritt 3: Spielen des Modus „Sprechen“



Durch Betätigung des „Start“-Buttons wird die Spracheingabe gestartet und es kann das Wort gesprochen werden.

Tipp: Bei der Spracheingabe kann es vorkommen, dass die Eingabe vom Gerät falsch wahrgenommen wird. So kann es sein, dass statt „Gans“ die Eingabe als „ganz“ interpretiert wird. Hier ist ein Kontext von Vorteil. Oft hilft es schon den Artikel vor dem Wort zu sprechen, damit es durch das System richtig erkannt wird („die Gans“). Es können aber auch ganze Sätze gebildet werden, worin das Wort vorkommt, um dem System die Interpretation zu erleichtern.

Schritt 4



Schritt 4: Abschluss des Kartensatzes im Modus „Bilderrätsel“. Es werden die erhalten XP gezeigt und direkt zum aktuellen Charakter-Level addiert (siehe Fortschrittsbalken). Außerdem werden die in diesem Spieldurchlauf verdienten Münzen dargestellt. Mittels des „Pfeil nach links“-Button kann auf die Spielübersichtsseite gewechselt werden. Es ist möglich den Kartensatz im selben Modus nochmals zu spielen, indem der „Pfeil Kreis“-Button gedrückt wird. Der abgeschlossene Kartensatz kann sofort mittels des „Modus“-Button im jeweils anderen Modus gespielt werden.

Multiplayer

Ablauf – Zwei Personen können gegeneinander ein Duell bestreiten, wobei dieses in asynchroner Form gefochten wird. Person A beginnt das Duell in einem der beiden Spielmodi „Schreiben“ oder „Sprechen“ und wählt Person B als Gegner/Gegnerin aus. Wenn Person A den Kartensatz und somit das Spiel beendet hat, erhält Person B eine Benachrichtigung (außer Person B befindet sich bereits im Spiel). Person B kann die Herausforderung annehmen und gegen Person A antreten, indem Person B denselben Kartensatz mit den gleichen Voraussetzungen (Begriffe/Karten erscheinen in der gleichen Reihenfolge) durchspielt. Sieger des Duells ist jene Person, welche die Begriffe des Kartensatzes in Summe schneller erkannt hat.

Lernziel – Die Multiplayer-Funktion soll dazu dienen das gemeinsame Spielen mit Freunden zu ermöglichen. Dadurch soll das Engagement der Lernenden nochmals gesteigert werden, da sie sich mit anderen Personen messen können, was sowohl positive Auswirkungen auf die intrinsische als auch extrinsische Motivation haben kann.

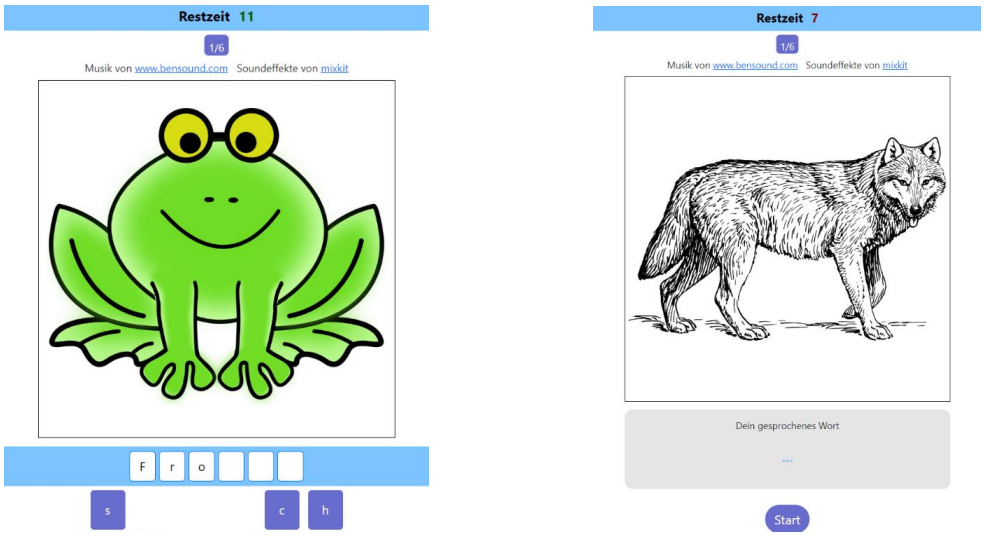


Abbildung 3: Darstellung der Spielmodi „Schreiben“ und „Sprechen“ im Multiplayermodus

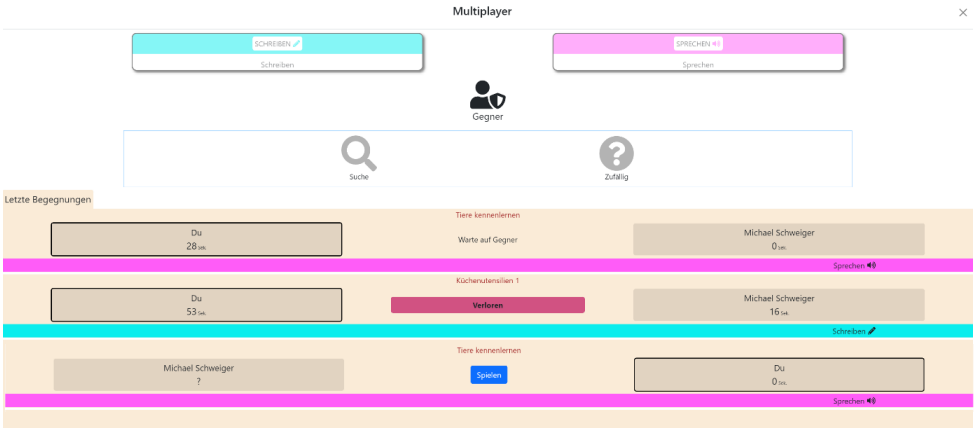
Grundsätzlich unterscheidet sich die Funktionsweise der Spielmodi „Schreiben“ und „Sprechen“ im Multiplayer nicht von derer im Einzespielermodus. Die einzige Veränderung ist, dass der Faktor Zeit hinzugefügt wird. Wie in Abbildung 3 zu sehen ist, läuft für jeden Begriff ein Timer ab. Dieser ist pro Wort auf 20 Sekunden begrenzt. Wird innerhalb dieser Zeitspanne keine korrekte „Antwort“ gegeben, wird automatisch zum nächsten Begriff im Kartensatz gesprungen und die 20 Sekunden werden zur

Gesamtzeit addiert. Sieger des Duells ist jene Person, welche am Ende für alle Begriffe des Kartensatzes die geringste Gesamtzeit benötigt hat. Außerdem ist es hier nicht möglich Begriffe mittels „Skip“-Button zu überspringen.

Multiplayer – Ein Beispiel

Schritt 1: Betätigen des Multiplayer-Buttons auf der Spielübersichtsseite (Startseite).

Öffnet Konfigurationsfenster



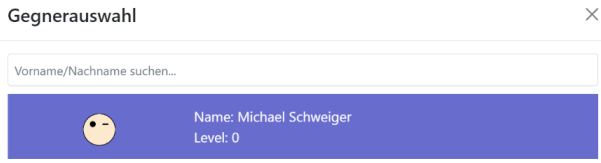
Schritt 2: Möchte man **selbständig ein Duell** gegen eine andere Person **beginnen** müssen folgende Einstellungen getroffen werden:

1. Auswahl des Spielmodus über die „Modus"-Button (Türkis – Schreiben, Lila – Sprechen).
2. Suchen eines Gegners/einer Gegnerin über die Gegnerinnenauswahl, welche sich öffnet, wenn auf das „Gegner"-Symbol gedrückt wird. Der Auswahlvorgang wird unter **Schritt 2.2** genauer beschrieben.
3. Auswahl eines Kartensatzes, welcher gespielt werden soll. Dieser Prozess ist ident zu jenem im Memory-Modus und kann dort nachgeschlagen werden (**Schritt 2** und **Schritt 2.2** im Abschnitt **Memory – Ein Beispiel**).

Wurde man **herausgefordert** und möchte das **Duell annehmen**, klickt man in der Liste „Letzte Begegnungen" auf den „Spielen-Button" (blaue Schaltfläche). Es müssen keine weiteren Einstellungen getroffen werden, das Spiel startet automatisch.

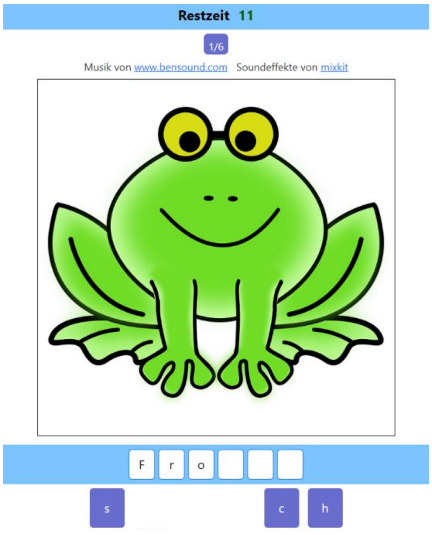
Schritt 3

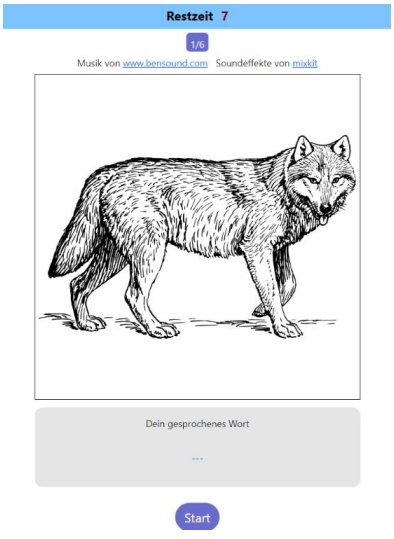
Schritt 2.2



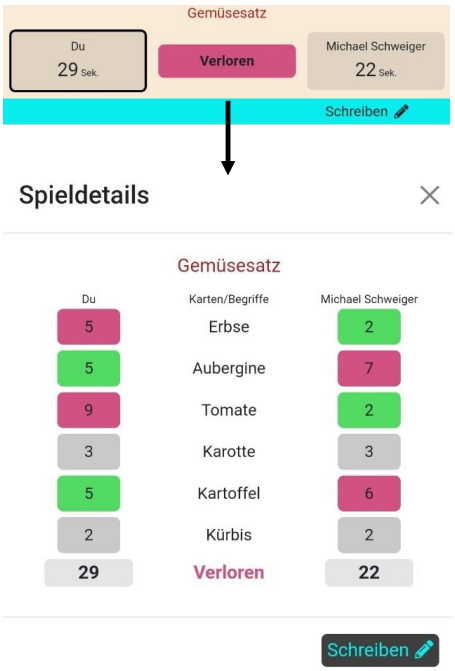
Schritt 2.2: Die Auswahl eines Gegners/einer Gegnerin erfolgt in dieser Ansicht. Hier werden alle registrierten Benutzer/innen in einer übersichtlichen Liste angezeigt. Um eine bestimmte Person auszuwählen, muss auf den entsprechenden Eintrag in der Liste geklickt werden. Die Auswahl wird übernommen und das Fenster automatisch geschlossen.

Über die Suchleiste kann nach bestimmten Personen mittels Vor- oder Nachnamen gesucht werden (Groß- und Kleinschreibung ist relevant!).



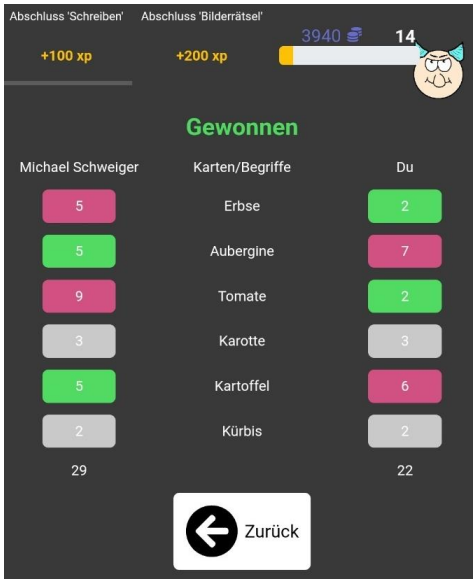


Schritt 3: Durchspielen des Kartensatzes so schnell wie möglich im gewählten Modus.



Schritt 4.2: Abschluss des Kartensatzes im Modus Multiplayer als jener Spieler/jene Spielerin der/die das Duell begonnen hat (erster Spieler/erste Spielerin). Um sich die Detailergebnisse des Duells ansehen zu können, muss über die Liste „Letzte Begegnungen“ zum entsprechenden Duell navigiert werden. Mit einem Klick auf den passenden Eintrag wird ein Fenster „Spieldetails“ geöffnet, wo sowohl Teilzeiten pro Begriff als auch die benötigten Gesamtzeiten gegenübergestellt werden.

Schritt 4: Abschluss des Multiplayer-Spiels



Schritt 4.1: Abschluss des Kartensatzes im Modus Multiplayer als jener Spieler/jene Spielerin der/die herausgefordert wurde (zweiter Spieler/zweite Spielerin). Diesem Spieler/Dieser Spielerin wird das Ergebnis direkt nach Abschluss des Spiels angezeigt. Es werden jeweils die benötigten Teilzeiten pro Begriff verglichen und die Gesamtzeit entscheidet über Sieg oder Niederlage.

4. Erstellen neuer Spielinhalte

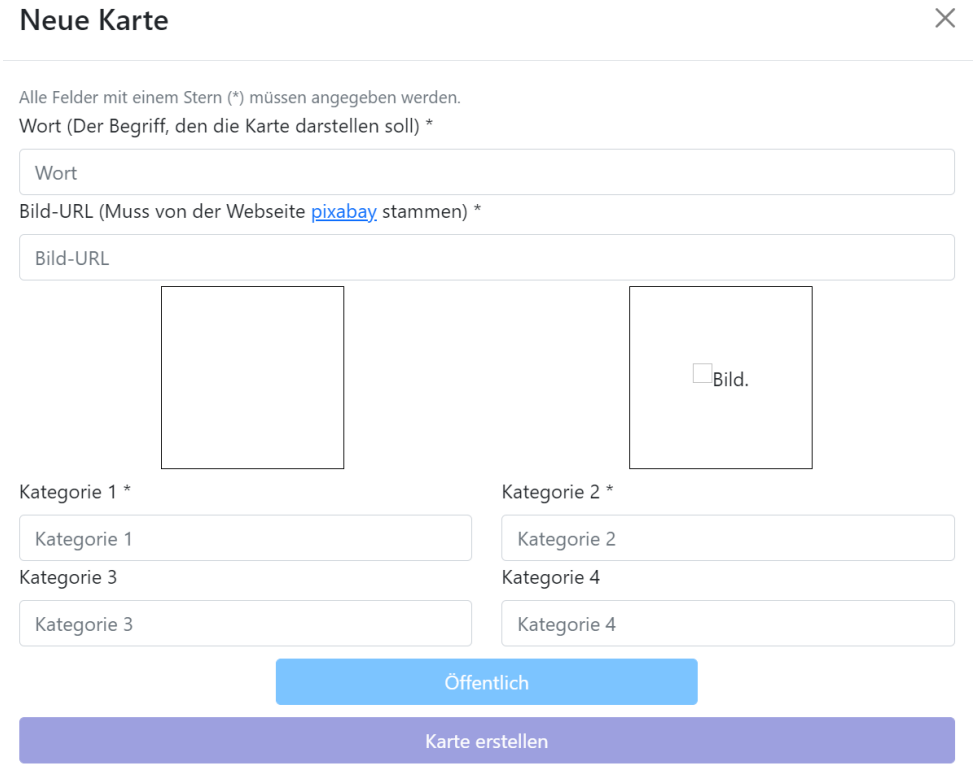
Um das Spiel interessant zu halten hat jede Person, welche einen gültigen Account besitzt und sich mit diesem angemeldet hat, die Möglichkeit neue Spielinhalte (Karten und Kartensätze) hinzuzufügen. So können beispielsweise Lehrpersonen neue Begriffe hinzufügen, welche gezielt mithilfe des Lernspiels geübt werden sollen (Vorbereitung auf Vokabeltest). Beim Hinzufügen neuer Spielinhalte sind folgende Schritte zu tätigen, welche nun genauer erläutert werden.

Hinzufügen neuer Karten – Ein Beispiel

Schritt 1: Mittels der Navigationsleiste auf die Seite „Deine Inhalte“ wechseln.

Schritt 2: Mittels des Buttons „Karten“ auf die Karten-Ansicht wechseln. Danach die Schaltfläche „Karte hinzufügen“ betätigen.

Öffnet Eingabeformular

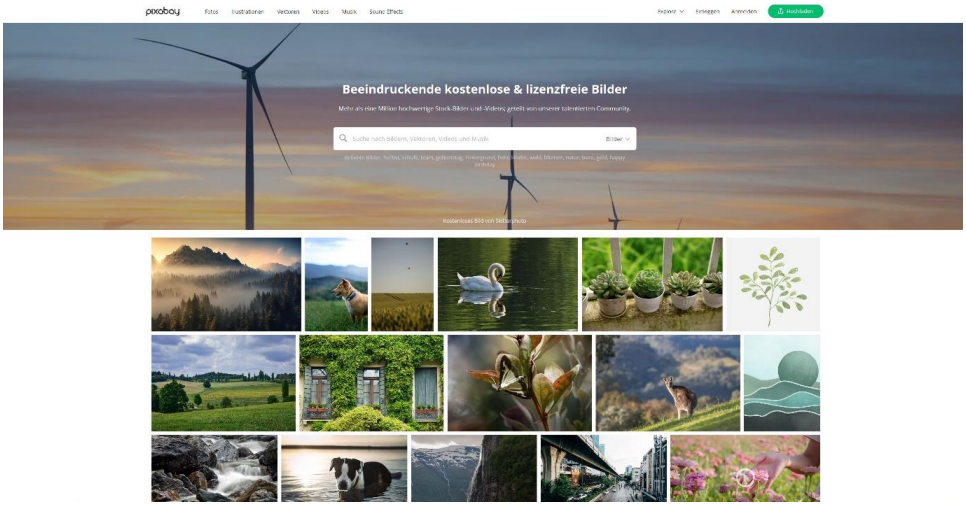


Schritt 3: Ausfüllen des dargestellten Formulars, um eine neue Karte (einen neuen Begriff) hinzuzufügen. Folgende Daten müssen bereitgestellt werden:

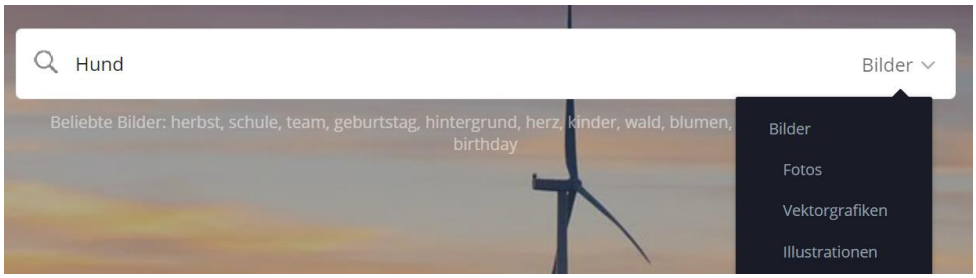
Wort – Der Begriff, welcher mithilfe dieser Karte repräsentiert werden soll.

Bild-URL – Das Bild, welches für die Bedeutung des Begriffs steht. Die URL muss von der Webseite https://pixabay.com/de/ stammen. Alle Bilder dieser Seite können ohne Verletzung des Urheberrechts verwendet werden. Es ist nicht erforderlich, die Quelle anzugeben oder eine Genehmigung für die Verwendung einzuholen. Der genaue Ablauf, wie man eine Bild-URL richtig hinzufügt, wird unter **Schritt 3.1** erläutert.

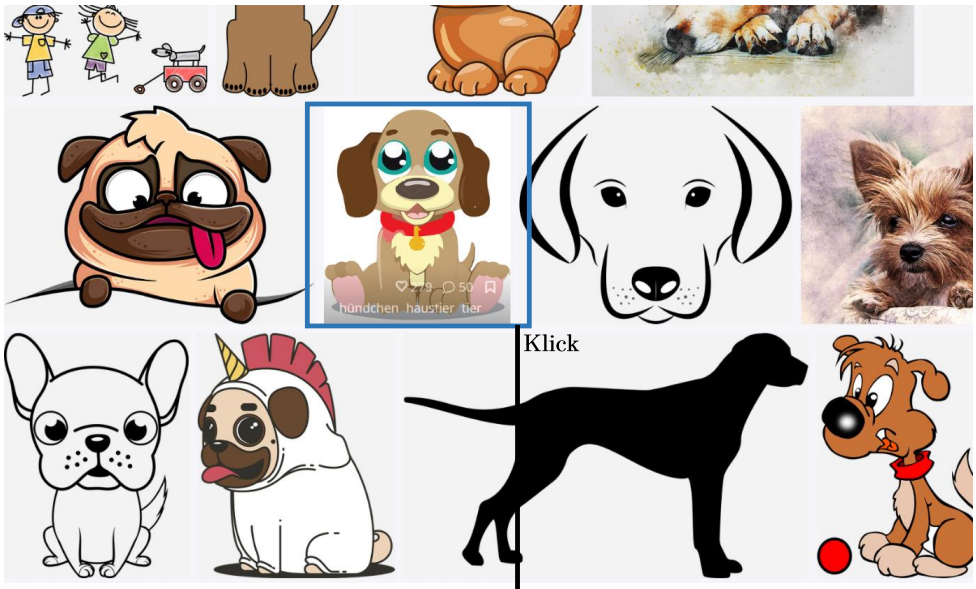
Kategorie – Damit beim Zusammenstellen neuer Kartensätze relevante Karten schnell und einfach gefunden werden können, müssen pro Karte mindestens zwei (maximal vier) Kategorien angegeben werden. Dabei ist zu beachten, dass alle Kategorien unterschiedlich sein müssen.



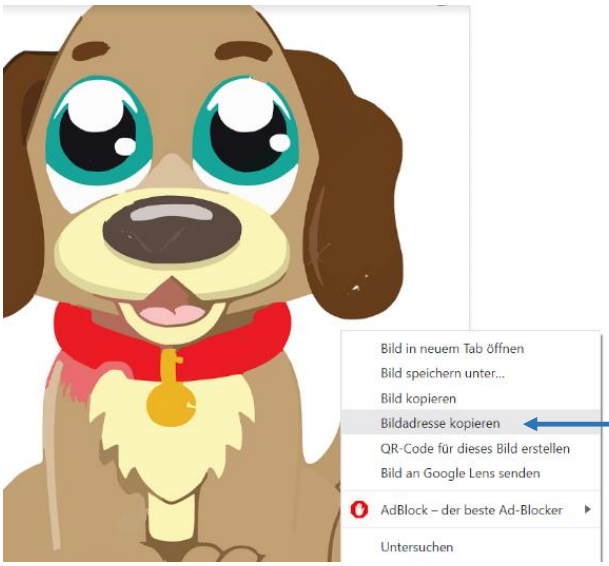
Schritt 3.1.1: Das passende Bild zu einem Begriff muss über die Seite https://pixabay.com/de/ gesucht werden. Am besten ist es, wenn man direkt über die Suchleiste auf der Startseite mithilfe des Begriffs nach relevanten Bildern sucht.



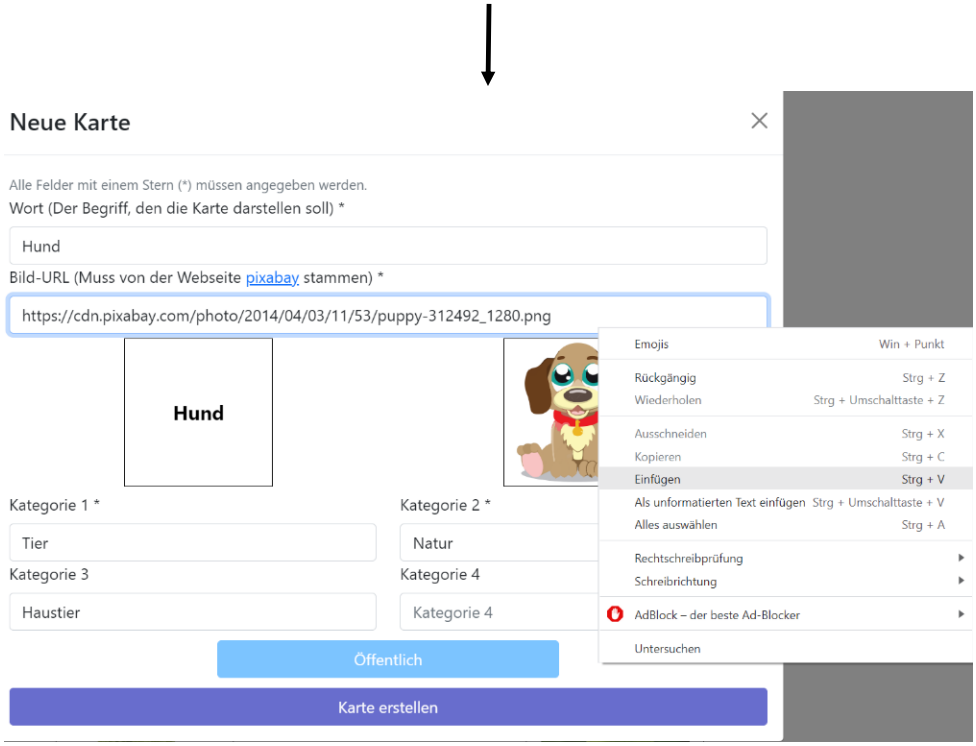
Schritt 3.1.2: Über den Drop-Down-Button auf der rechten Seite kann man einstellen, nach welche Art von Bildern man suchen möchte. Bei der Einstellung „Fotos“ werden tatsächlich Bilder, welche mit einer Kamera aufgenommen wurden, zurückgeliefert. Wählt man hingegen „Vektorgrafiken“ oder „Illustrationen“ erhält man oftmals gezeichnete Bilder anstatt „echter“ Fotos.



Schritt 3.1.3: Hat man ein passendes Bild gefunden, drückt man darauf und wechselt somit auf die nachfolgende Seite.



Schritt 3.1.4: Durch einen „Rechtsklick“ mithilfe der Maus auf das Bild öffnet sich ein Fenster, wo man „Bildadresse kopieren“ auswählen muss, um die URL in die Zwischenablage zwischenzuspeichern.

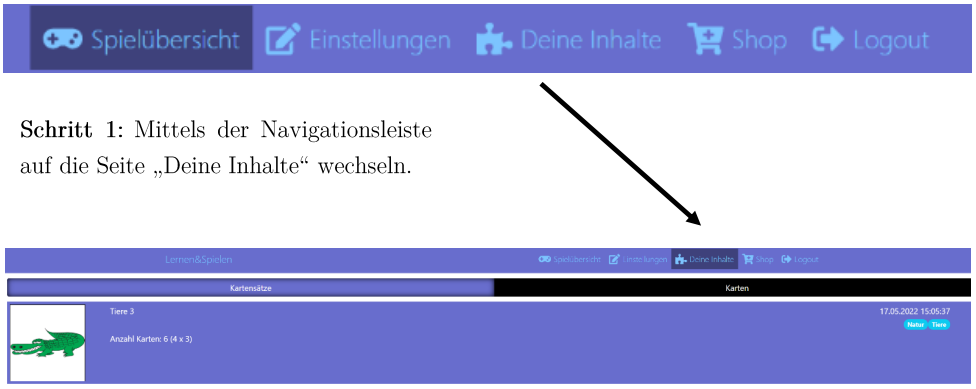


Schritt 3.1.5: Schlussendlich muss man die URL noch in das dafür vorgesehene Eingabefeld kopieren. Entweder verwendet man dazu den Shortcut „Strg + V“ oder macht einen „Rechtsklick“ auf das Eingabefeld und wählt „Einfügen“ aus.

Da nun alle Felder korrekt ausgefüllt sind (keine Fehlermeldungen vorhanden) wird der Button „Karte erstellen“ verwendbar. Mit Betätigung dieser Schaltfläche schließt sich das Fenster und die Karte wird in der Übersicht über alle bereits ersteltlen Karten des aktuell angemeldeten Benutzers/der aktuell angemeldeten Benutzerin als Erste angezeigt.

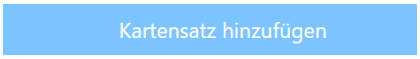
Hinweis: Sollte kein passendes Bild existieren ist es möglich selbständig Bilder auf pixabay hochzuladen, indem man sich einen gültigen Account auf der Webseite erstellt. Natürlich muss beim Hinzufügen darauf geachtet werden, dass man die Rechte für die Bilder besitzt.

Hinzufügen neuer Kartensätze – Ein Beispiel



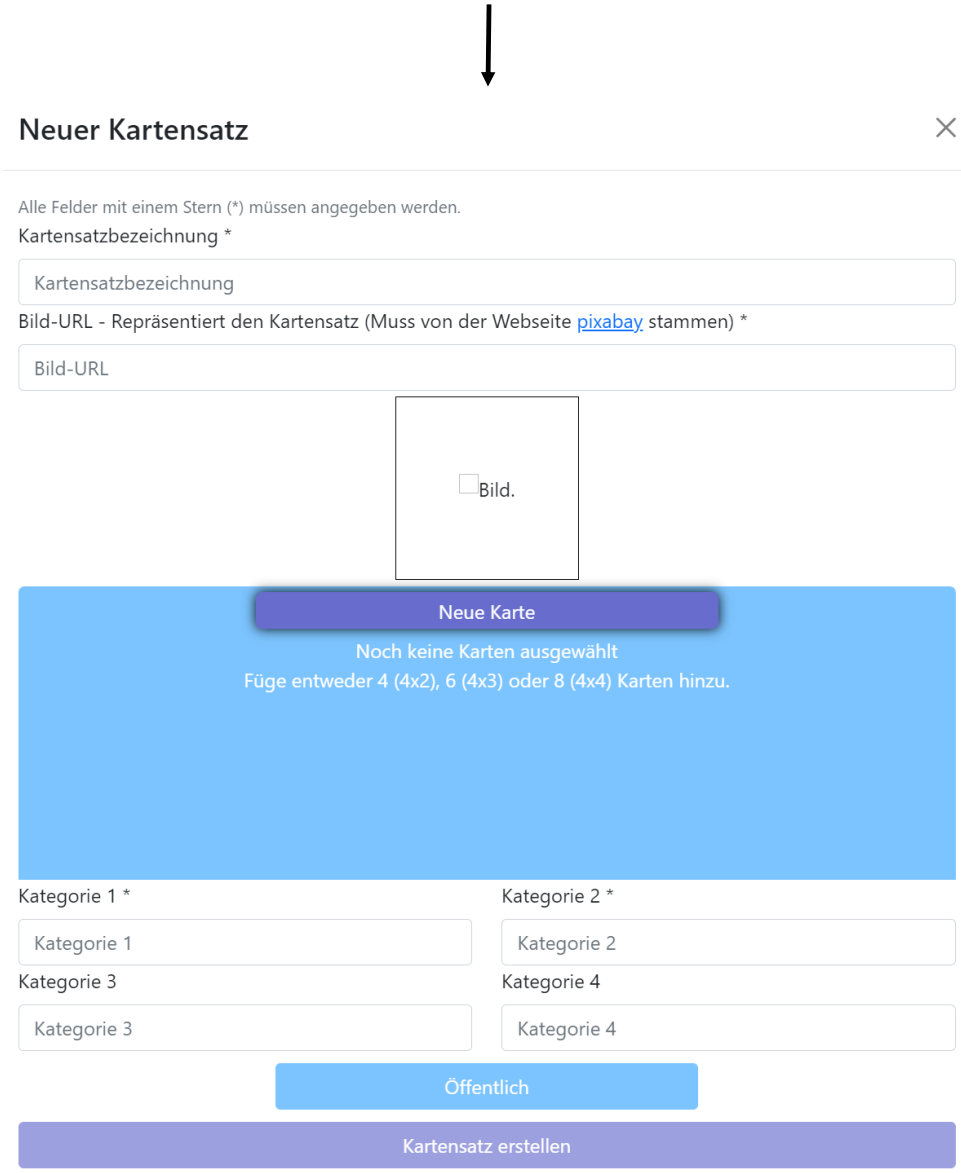
Schritt 1: Mittels der Navigationsleiste auf die Seite „Deine Inhalte“ wechseln.

... ...



Schritt 2: Mittels des Buttons „Kartensatz“ auf die Kartensatz-Ansicht wechseln (sollte standardmäßig ausgewählt sein). Danach die Schaltfläche „Kartensatz hinzufügen“ betätigen.

Öffnet Eingabeformular



Schritt 3: Ausfüllen des dargestellten Formulars, um einen neuen Kartensatz hinzuzufügen. Folgende Daten müssen bereitgestellt werden:

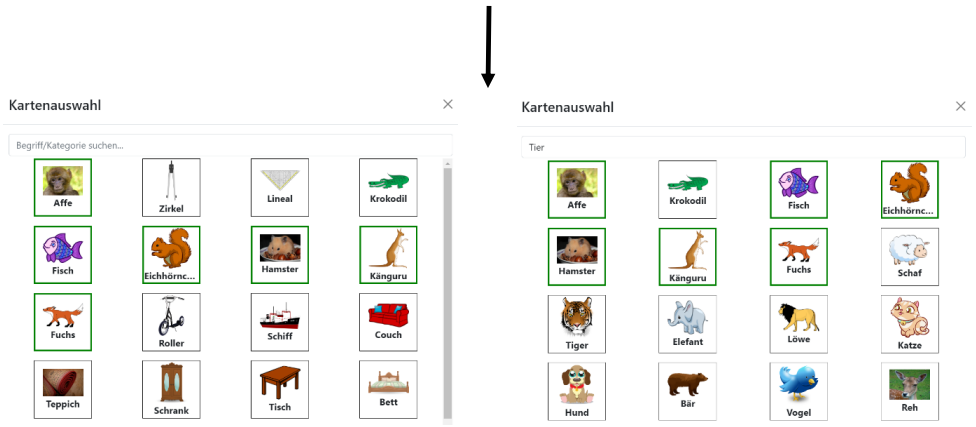
Kartensatzbezeichnung – Der Name des Kartensatzes. Sollte die Art der beinhalteten Karten widerspiegeln.

Bild-URL – Ein Bild, welches den Kartensatz repräsentiert. Soll vor allem Kindern dabei helfen zu erkennen, welche Art von Begriffen dieser Kartensatz beinhaltet. Das Hinzufügen einer Bild-URL läuft nach dem selben Schema ab, wie das Hinzufügen von Bildern beim Erstellen neuer Karten (siehe **Hinzufügen neuer Karten – Schritt 3.1**).

Kartenauswahl (blauer Bereich) – Durch einen Klick auf den „Neue Karte“-Button öffnet sich ein Fenster, wo aus allen zur Verfügung stehenden Karten gewählt werden kann. Diese Sammlung an Karten setzen sich aus allen bis zu diesem Zeitpunkt hinzugefügten Karten zusammen. Das Hinzufügen von Karten wird unter **Schritt 3.1** genauer beschrieben.

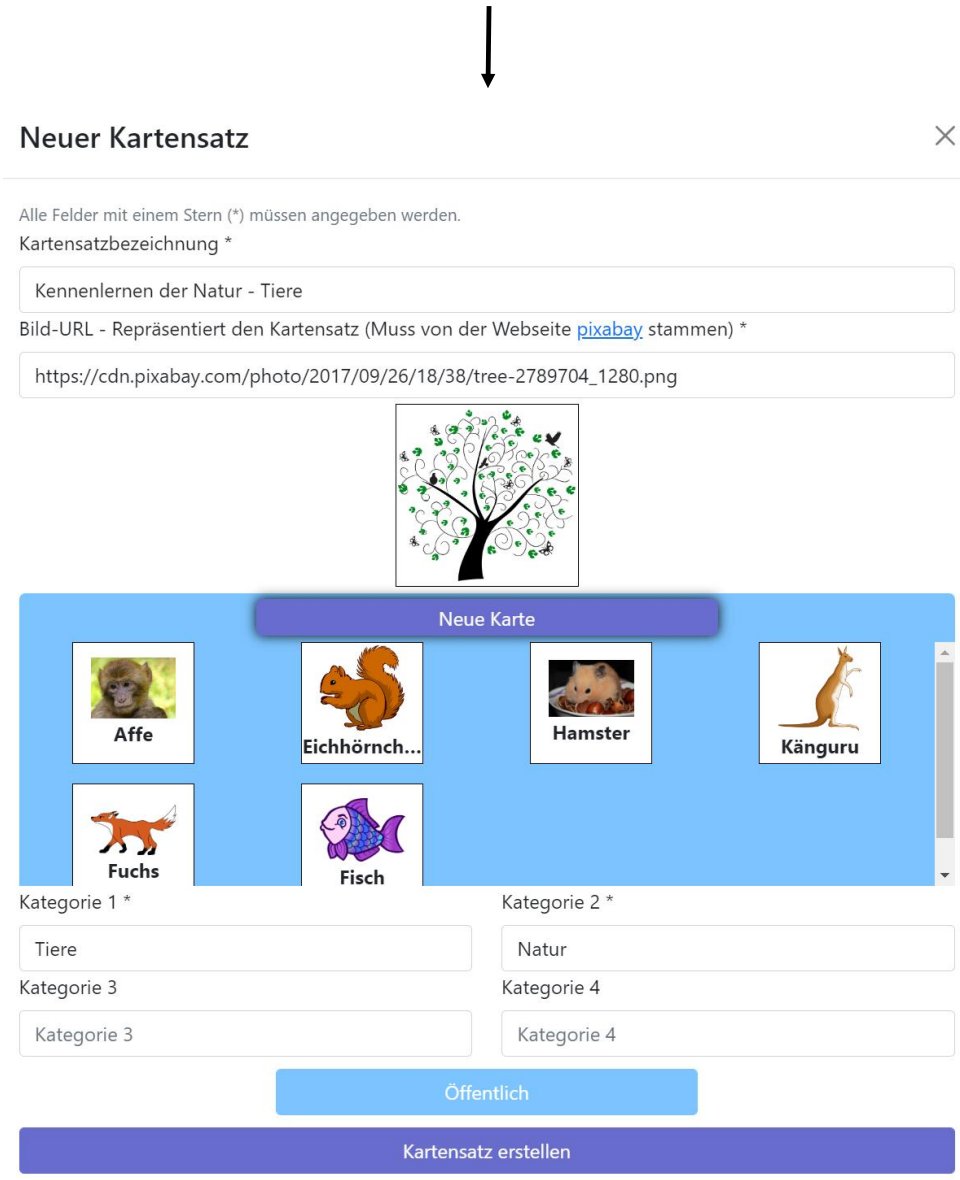
<u>Wichtig:</u> Es können nicht beliebig viele Karten einen Kartensatz bilden. Es müssen entweder **vier (4), sechs (6)** oder **acht (8)** Karten ausgewählt werden. Das hat einerseits den Grund, dass ein Memory-Spiel sinnvoll auf einem Smartphone-Bildschirm angezeigt werden kann. Andererseits sollen die Lernenden schnell Erfolge sehen. Ein Kartensatz mit 50 Karten würde schnell demotivierend wirken.

Kategorie – Wenn Spieler/innen keinen zufälligen Kartensatz spielen möchten, dienen Kategorien dazu, schnell und bequem interessante Kartensätze zu finden. Es müssen mindestens zwei (maximal vier) Kategorien angegeben werden, wobei alle bereitgestellten Kategorien unterschiedlich sein müssen.



Schritt 3.1: Im geöffneten Fenster können Karten für den Kartensatz ausgewählt werden, indem auf sie geklickt wird. Im Beispiel, welches auf der linken Seite zu sehen ist, wird keine Filterung (Suchleiste leer) vorgenommen. Daher werden verschiedenste Karten angezeigt. Anders im Beispiel auf der rechten Seite, wo nur nach Karten gesucht wird, welche Tiere zeigen (somit die Kategorie „Tier“ besitzen). Mit einem Klick auf das „X“ schließt man das Fenster und die Auswahl wird automatisch übernommen und im blauen Bereich angezeigt.

Möchte man eine Karte wieder entfernen muss man nochmals auf diese klicken, womit sie aus der Auswahl gelöscht wird.



Schritt 4: Ist das Eingabeformular vollständig und korrekt ausgefüllt (keine Fehlermeldungen) wird der Button „Kartensatz erstellen“ verwendbar. Durch die Betätigung dieser Schaltfläche wird der Kartensatz hinzugefügt und kann nun von allen Benutzer/innen in den verschiedenen Spielmodi gespielt werden.

5. Vorgehen im Fehlerfall

Die Applikation wurde in mehreren Durchgängen auf den unterschiedlichsten Geräten unter Verwendung verschiedenster Browser getestet. Bei diesen Tests kam es zu keinen Systemfehlern, sprich Abstürze des Lernspiels oder ähnlichem. Dennoch kann es trotz aufwendiger Testverfahren immer wieder zu zuvor nicht aufgetretenen Fehlerzuständen kommen. Oftmals hilft aktualisieren bzw. neu laden des Lernspiels. Da dieses über den Browser läuft muss der entsprechende Browser-Tab „refreshed“ werden.

Bei nicht korrekter Verwendung des Lernspiels (z.B. nicht korrekt ausgefülltes Formular beim Erstellen neuer Spielinhalte, Starten eines Memory-Spiels ohne Auswahl eines Levels usw.) liefert die Applikation selbständig Hilfestellungen in Form von Fehlermeldungen (roter Schrift) oder akustisch, durch die integrierte Sprachausgabe.

6. Anhang

Alle nachfolgenden Seiten dienen als Vorlagen und können im Rahmen der Studie bei Bedarf verwendet werden.

Protokoll

Durch dieses Dokument können gegebenenfalls interessante Informationen in einer strukturierten Art und Weise festgehalten werden, welche womöglich in die Studie integriert werden können.

Einverständniserklärung / Declaration of consent

Bei Personen, welche noch nicht volljährig sind, muss das Einverständnis der Erziehungsberechtigten eingeholt werden, sodass sie für die Teilnahme an der Studie berechtigt sind.

Zugangsdaten für Teilnehmer/innen

Zugangsdaten für angelegte Accounts, welche bei Bedarf an die Studienteilnehmer/innen ausgeteilt werden können.

Protokoll

Name u. Unterschrift der Lehrperson: _____

Allgemeine Informationen		Nr. Sitzung _____
Datum _____	Schulstufe _____	Anwendungsdauer _____

Verwendete Konfiguration					
Verwendete Geräte					
	Smartphone	Laptop	Desktop-PC	Tablet	
Verwendete Browser					
	Google Chrome	Microsoft Edge	Mozilla Firefox	Safari	Andere
Benutzerstatus					
	Angemeldet		Gast		

Zusatzinformationen

Positive Erkenntnisse

Negative Erkenntnisse

Aufgetretene Probleme

Einverständniserklärung zur Teilnahme an der Studie

Mein Sohn / meine Tochter _____ ist für die Teilnahme an der Studie, welche im Zuge der Masterarbeit „Digital game-based learning for language acquisition“ durchgeführt wird, berechtigt. Im Rahmen der Studie wird untersucht, ob der Einsatz eines digitalen Lernspiels, welches gezielt Spielelemente (Avatare, Punkte, Ranglisten usw.) zur Motivationssteigerung integriert, positive Auswirkungen auf das Engagement der Teilnehmer/innen in Bezug auf das Deutschlernen zeigt. Die Studie kann es erfordern, persönliche Daten, wie Name, Alter, Geschlecht etc. der Teilnehmer/innen abzufragen. Diese werden jedoch ausschließlich für wissenschaftliche Zwecke verwendet.

_____ _____

(Datum) (Unterschrift des Erziehungsberechtigten)

Einverständniserklärung zur Teilnahme an der Studie

Mein Sohn / meine Tochter _____ ist für die Teilnahme an der Studie, welche im Zuge der Masterarbeit „Digital game-based learning for language acquisition“ durchgeführt wird, berechtigt. Im Rahmen der Studie wird untersucht, ob der Einsatz eines digitalen Lernspiels, welches gezielt Spielelemente (Avatare, Punkte, Ranglisten usw.) zur Motivationssteigerung integriert, positive Auswirkungen auf das Engagement der Teilnehmer/innen in Bezug auf das Deutschlernen zeigt. Die Studie kann es erfordern, persönliche Daten, wie Name, Alter, Geschlecht etc. der Teilnehmer/innen abzufragen. Diese werden jedoch ausschließlich für wissenschaftliche Zwecke verwendet.

_____ _____

(Datum) (Unterschrift des Erziehungsberechtigten)

Declaration of consent to participate in the study

My son / my daughter _____ is permitted to participate in the study, which is conducted in the course of the master thesis "Digital game-based learning for language acquisition". The study will investigate whether the use of a digital learning game that specifically integrates game design elements (avatars, points, leaderboards, etc.) to increase motivation has a positive impact on participants' engagement in learning German or not. However, the study may require asking for personal data, such as name, age, gender, etc. of the participants. Nevertheless, these data will be used exclusively for scientific purposes.

(Date) (Signature of a parent or legal guardian)

Declaration of consent to participate in the study

My son / my daughter _____ is permitted to participate in the study, which is conducted in the course of the master thesis "Digital game-based learning for language acquisition". The study will investigate whether the use of a digital learning game that specifically integrates game design elements (avatars, points, leaderboards, etc.) to increase motivation has a positive impact on participants' engagement in learning German or not. However, the study may require asking for personal data, such as name, age, gender, etc. of the participants. Nevertheless, these data will be used exclusively for scientific purposes.

(Date) (Signature of a parent or legal guardian)

https://lernenundspielen-f1587.web.app/

E-Mail:

_____

Passwort:

_____

https://lernenundspielen-f1587.web.app/

E-Mail:

_____

Passwort:

_____

https://lernenundspielen-f1587.web.app/

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Passwort:

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https://lernenundspielen-f1587.web.app/

E-Mail:

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Passwort:

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Passwort:

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https://lernenundspielengruppe2.web.app/

E-Mail:

_____

Passwort:

_____

A.3. Pre-Fragebogen

Vorinterview

Lieber Studienteilnehmer/Liebe Studienteilnehmerin,

mithilfe dieses Fragebogens wird einerseits in Erfahrung gebracht, wie du digitale Geräte nutzt, andererseits werden dir allgemeine Fragen zum Deutschlernen gestellt. Das Ausfüllen des Fragebogens geschieht auf freiwilliger Basis und völlig anonym. Es können keinerlei Rückschlüsse auf deine Person gezogen werden.

Der Fragebogen gliedert sich in drei Bereiche:

A. **Erhebung statistischer Daten zur Person**
B. **Nutzung digitaler Geräte**
C. **Deutschlernen**

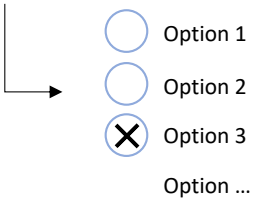
Durch Beantwortung der Fragen hilfst du mir enorm bei der Durchführung meiner Masterarbeit.

Danke für deine Teilnahme.

Datum	Schule/Organisation

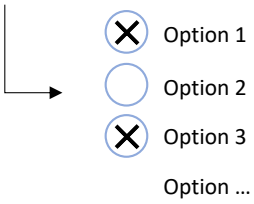
Hilfestellung zur Fragenbeantwortung

* (Einzelauswahl)



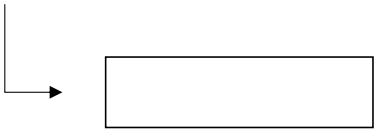
Ist die Frage mit einem * (oranger Stern) markiert, darf nur eine Antwort-Option angekreuzt werden.

* (Mehrfachauswahl)



Ist die Frage mit einem * (grüner Stern) markiert, dürfen mehrere Antwort-Optionen angekreuzt werden.

Offene Antwortmöglichkeit



Bei dieser Art von Antwortmöglichkeit kann die Frage mit eigenen Worten beantwortet werden.

A. Erhebung statistischer Daten zur Person

Welchem Geschlecht fühlst du dich zugehörig? *

- ◯ männlich
- ◯ weiblich
- ◯ divers

Wie alt bist du? *

- ◯ unter 10
- ◯ 10
- ◯ 11
- ◯ 12
- ◯ 13
- ◯ 14
- ◯ 15
- ◯ über 15

B. Nutzung digitaler Geräte

Welche Art von Geräten verwendest du häufiger? *

- ◯ Mobile-Geräte (Handy, Smartphone, Tablet, etc.)
- ◯ Desktop-Geräte (Computer, Laptop, etc.)

Wie viele Stunden täglich verwendest du digitale Geräte? *

- ◯ weniger als 1 Stunde
- ◯ 1-2 Stunden
- ◯ 2-3 Stunden
- ◯ 3-4 Stunden
- ◯ 4-5 Stunden
- ◯ mehr als 5 Stunden
- ◯ Gar nicht

Wofür nutzt du digitale Geräte? (Mehrfachauswahl möglich) *

- ◯ Zum Spielen
- ◯ Zum Musik hören
- ◯ Zum Videos schauen
- ◯ Für Soziale Netzwerke (Facebook, Instagram, TikTok, Snapchat, Twitter, etc.)
- ◯ Zum Nachrichten schreiben (WhatsApp, Telegram, Signal, etc.)
- ◯ Zum Telefonieren
- ◯ Zum Lernen

Sonstiges: ☐

C. Deutschlernen

Wie lernst du aktuell Deutsch? (Mehrfachauswahl möglich) *

- ◯ Mithilfe von digitalen Lernspielen
- ◯ Mithilfe von Filmen (Sendungen)
- ◯ Mithilfe von digitalen Lernmaterialien
- ◯ Mithilfe von deutschen Lehrbüchern
- ◯ Durch den Unterricht in der Schule
- ◯ Mithilfe der Familie/Eltern/Geschwister
- ◯ Durch Freunde bzw. Freundinnen
- ◯ Mit den Klassenkollegen bzw. Klassenkolleginnen

Sonstiges: ____

Hast du schon einmal ein Lernspiel für Deutsch ausprobiert? *

Ja  ◯

Nein  ◯

Falls du schon einmal ein Lernspiel ausprobiert hast, kannst du dessen Namen angeben? (Offene Frage)

Name des Lernspiels: ____

Was hat dir an diesem Lernspiel besonders gut gefallen? (Offene Frage)

____

Was hat dir an diesem Lernspiel nicht so gut gefallen? (Offene Frage)

Warum lernst du Deutsch? (Offene Frage)

Wie oft werden digitale Geräte zum Deutschlernen im Unterricht eingesetzt? *

Gar nicht | Einmal im Monat | Einmal pro Woche | Fast in jeder Stunde

Wie wichtig findest du es, dass man in Österreich Deutsch sprechen/lesen/schreiben kann? *

Nicht wichtig | Eher unwichtig | Egal | Wichtig | Sehr wichtig

Wie viel Spaß macht dir der Deutschunterricht in der Schule? *

Keinen Spaß	Wenig Spaß	Geht so	Viel Spaß	Sehr viel Spaß
				
○	○	○	○	○

Würdest du gerne Deutsch mit einem Spiel am Computer/Handy lernen? *

Nein	Eher nicht	Egal	Eher ja	Sehr gerne
				
○	○	○	○	○

A.4. Pre-questionnaire

Pre-interview

Dear study participant,

this questionnaire is designed to find out how you use digital devices and to ask you general questions about the way you learn German. Completing the questionnaire is voluntary and totally anonymous. No conclusions can be drawn about your person.

The questionnaire is divided into three sections:

A. **Collection of statistical data about the person**
B. **Usage of digital devices**
C. **Learning German**

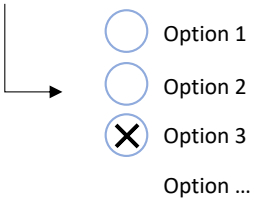
By answering the questions, you are helping me a lot to complete my master's thesis.

Thanks for participating.

Date	School/Organization

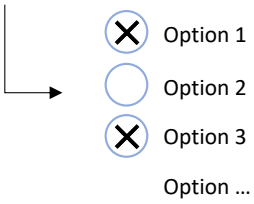
Help for answering the questions

* (Single choice)



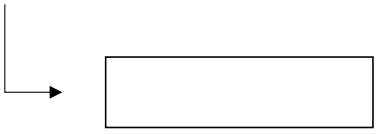
If the question is marked with a * (orange star), only one answer option can be ticked.

* (Multiple choice)



If the question is marked with a * (green star), multiple answer options can be ticked.

Open answer option



This type of answer option allows you to answer the question in your own words.

A. Collection of statistical data about the person

Please state your gender? *

- male
- female
- diverse

How old are you? *

- younger than 10
- 10
- 11
- 12
- 13
- 14
- 15
- older than 15

B. Usage of digital devices

What kind of devices do you use more often? *

- ◯ Mobile devices (smartphone, tablet, etc.)
- ◯ Desktop devices (computer, laptop, etc.)

How many hours a day do you use digital devices? *

- ◯ less than 1 hour
- ◯ 1-2 hours
- ◯ 2-3 hours
- ◯ 3-4 hours
- ◯ 4-5 hours
- ◯ more than 5 hours
- ◯ Not at all

What do you use digital devices for? (Multiple choice possible) *

- ◯ playing games
- ◯ listening to music
- ◯ watching videos
- ◯ social networks (Facebook, Instagram, TikTok, Snapchat, Twitter, etc.)
- ◯ writing messages (WhatsApp, Telegram, Signal, etc.)
- ◯ making calls
- ◯ learning

Others: _____

C. Learning German

How do you currently learn German? (Multiple choice possible) *

- ◯ With the help of digital learning games
- ◯ With the help of movies
- ◯ With the help of digital learning materials
- ◯ With the help of German textbooks
- ◯ Through the lessons at school
- ◯ With the help of family/parents/siblings
- ◯ With friends
- ◯ With classmates

Others: _____

Have you ever tried a learning game for German? *

Yes  ◯

No  ◯

If you have tried a learning game, can you name it? (Open question)

Name of the game: _____

What did you like most in this learning game? (Open question)

_____

What did you not like that much in this learning game? (Open question)

Why are you learning German? (Open question)

How often are digital devices used in class to learn German? *

Not at all | Once a month | Once a week | Almost every lesson

In your opinion, how important is it to be able to speak/read/write German in Austria? *

Not important | Rather unimportant | Doesn't matter | Important | Very, very important

How much do you enjoy the German lessons at school? *

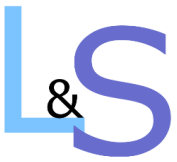
No fun at all	Less fun	It's okay	Funny	Very, very funny
				
○	○	○	○	○

Are you interested in learning German by playing a game on your computer/mobile phone? *

Not at all	Rather not	Doesn't matter	Rather yes	Yes, very much
				
○	○	○	○	○

A.5. Post-Fragebogen

Fragebogen zum Lernspiel



Lieber Studienteilnehmer/Liebe Studienteilnehmerin,

mithilfe dieses Fragebogens wird in Erfahrung gebracht, wie dir das verwendete Lernspiel „Lernen&Spielen“ gefallen hat und wie dein Eindruck gegenüber dem digitalen Lernen ist. Das Ausfüllen des Fragebogens geschieht auf freiwilliger Basis und völlig anonym. Es können keinerlei Rückschlüsse auf deine Person gezogen werden.

Der Fragebogen gliedert sich in drei Bereiche:

A. **Erhebung statistischer Daten zur Person**
B. **Eindruck vom angewendeten Lernspiel**
C. **Meinung zum digitalen Lernen**

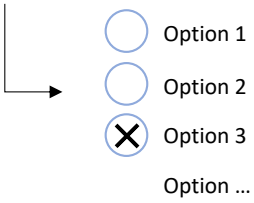
Durch Beantwortung der Fragen hilfst du mir enorm bei der Durchführung meiner Masterarbeit.

Danke für deine Teilnahme.

Datum	Schule/Organisation

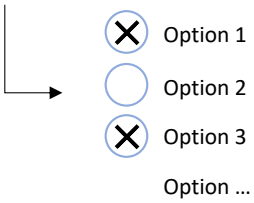
Hilfestellung zur Fragenbeantwortung

* (Einzelauswahl)



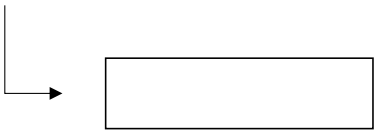
Ist die Frage mit einem * (oranger Stern) markiert, darf nur eine Antwort-Option angekreuzt werden.

* (Mehrfachauswahl)



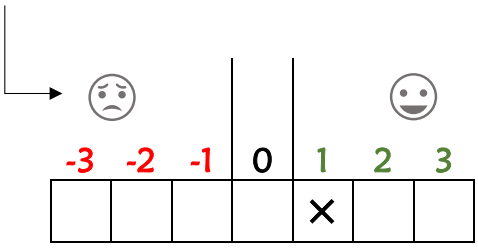
Ist die Frage mit einem * (grüner Stern) markiert, dürfen mehrere Antwort-Optionen angekreuzt werden.

Offene Antwortmöglichkeit



Bei dieser Art von Antwortmöglichkeit kann die Frage mit eigenen Worten beantwortet werden.

Skalenbewertung



Bei dieser Art von Antwortmöglichkeit kannst du angeben, ob du etwas als **positiv** (**1 <-> 3**; **grün**), **neutral** (**0**; **schwarz**) oder als **negativ** (**-1 <-> -3**; **rot**) empfunden hast.

A. Erhebung statistischer Daten zur Person

Welchem Geschlecht fühlst du dich zugehörig? *

- ◯ männlich
- ◯ weiblich
- ◯ divers

Wie alt bist du? *

- ◯ unter 10
- ◯ 10
- ◯ 11
- ◯ 12
- ◯ 13
- ◯ 14
- ◯ 15
- ◯ über 15

B. Eindruck vom angewendeten Lernspiel

Wie viel Spaß hattest du bei der Verwendung des Lernspiels? *

Keinen Spaß	Wenig Spaß	Ging so	Viel Spaß	Sehr viel Spaß
				
○	○	○	○	○

Was hat dir an diesem Lernspiel besonders gut gefallen? (Offene Frage)

Was hat dir an diesem Lernspiel nicht so gut gefallen? (Offene Frage)

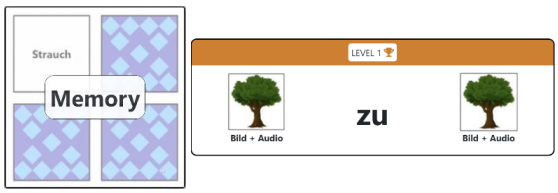
Würdest du das Lernspiel deinen Freund/innen empfehlen? *

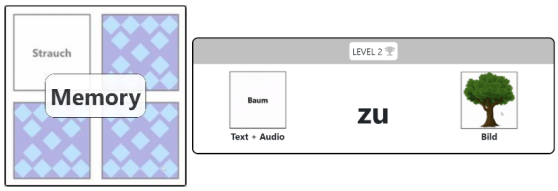
Ja

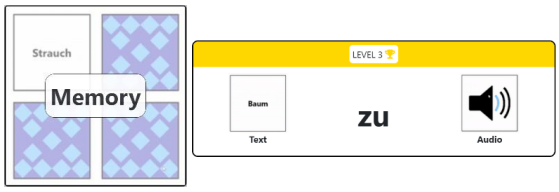
Nein

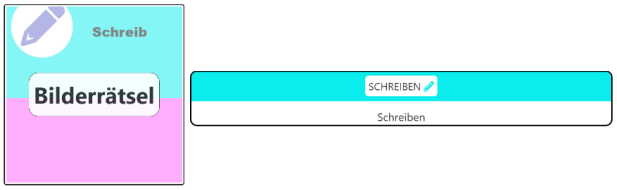
Warum würdest du das Lernspiel empfehlen/nicht empfehlen? (Offene Frage)

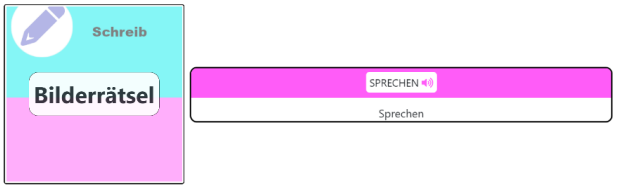
Welchen Spielmodus würdest du spielen, wenn du dich jetzt für einen entscheiden müsstest? *

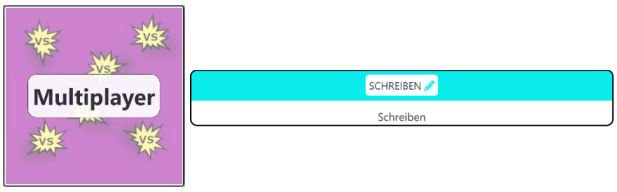


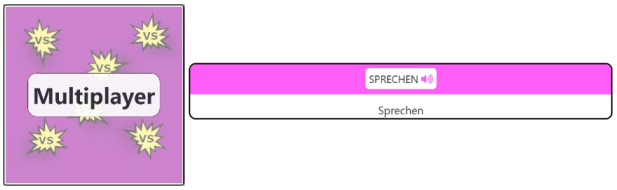












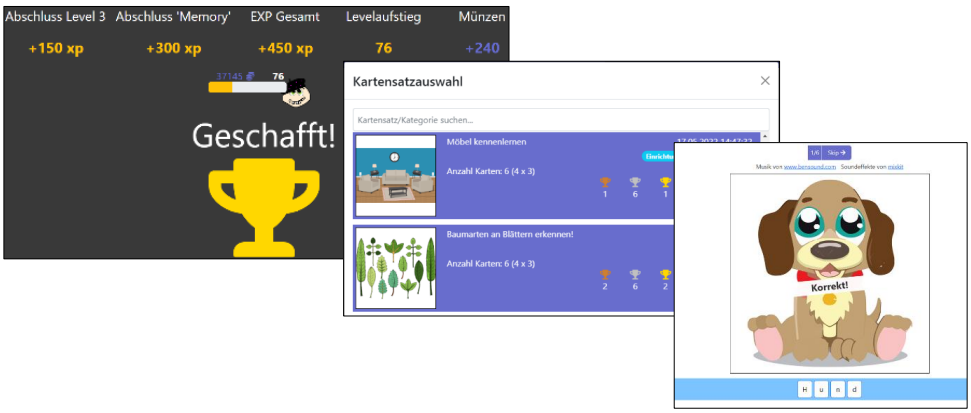
Spielelement 1 - Avatar

Wie motivierend war es für dich, einen Avatar zu besitzen, welcher dich im Spiel repräsentiert? *

	-3	-2	-1	0	1	2	3	
Extrem demotivierend								**Extrem motivierend**

Warum wurdest du durch dieses Spielelement „Avatar“ positiv motiviert/negativ motiviert? (Offene Frage)

Spielelement 2 – Feedback

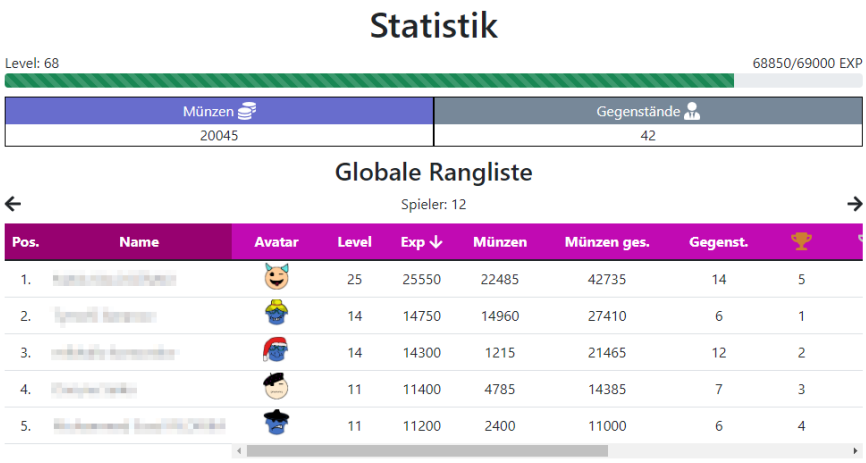


Wie motivierend war es für dich, Feedback während des Spielens zu erhalten? *

	-3	-2	-1	0	1	2	3	
Extrem demotivierend								**Extrem motivierend**

Warum wurdest du durch dieses Spielelement „Feedback“ positiv motiviert/negativ motiviert? (Offene Frage)

Spielelement 3 – Punkte, Level und Rangliste

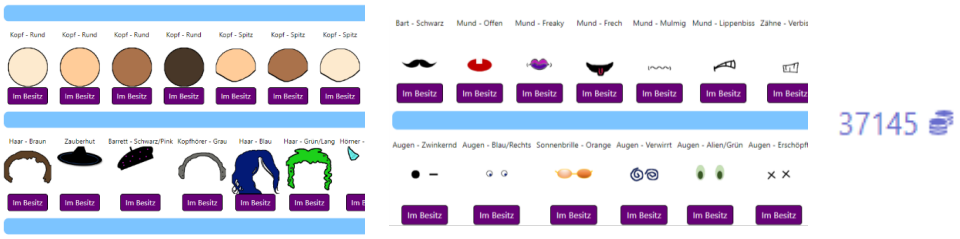


Wie motivierend war es für dich, Punkte zu erhalten, Level aufzusteigen und dich mit anderen Spielern in der Rangliste vergleichen zu können? *

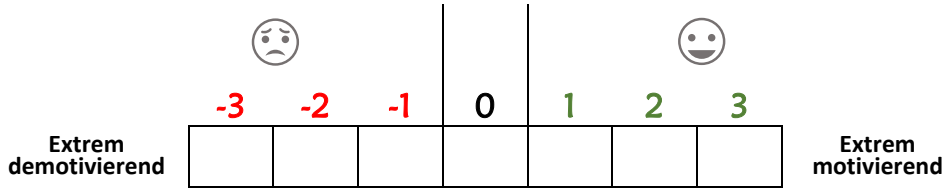
	-3	-2	-1	0	1	2	3	
Extrem demotivierend								**Extrem motivierend**

Warum wurdest du durch dieses Spielelement „Punkte, Level und Rangliste“ positiv motiviert/negativ motiviert? (Offene Frage)

Spielelement 4 – Münzen und Shop

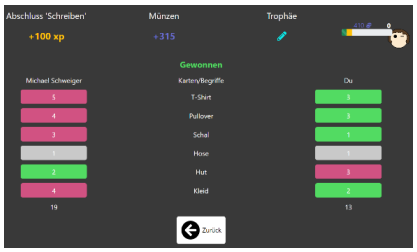


Wie motivierend war es für dich, Münze zu erhalten, welche du dann im Shop für Gegenstände zum Anpassen deines Avatars einlösen konntest? *



Warum wurdest du durch dieses Spielelement „Münzen und Shop“ positiv motiviert/negativ motiviert? (Offene Frage)

Spielelement 5 – Multiplayer

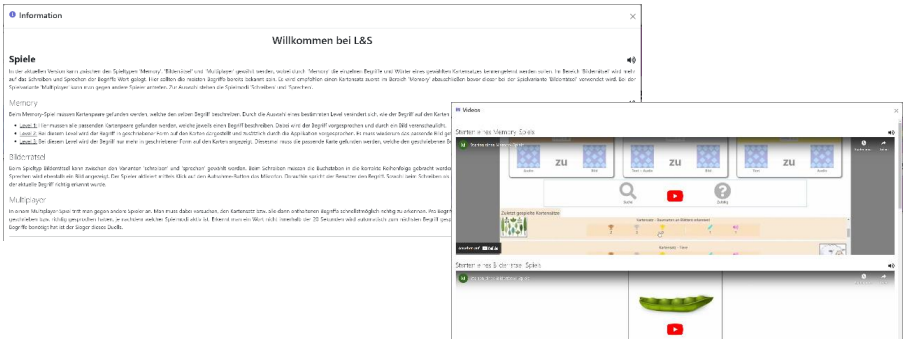


Wie motivierend war es für dich, gegen deine Freund/innen bzw. Klassenkolleg/innen im Multiplayer-Modus spielen zu können? *

	-3	-2	-1	0	1	2	3	
Extrem demotivierend								**Extrem motivierend**

Warum wurdest du durch dieses Spielelement „Multiplayer“ positiv motiviert/negativ motiviert? (Offene Frage)

Spielelement 6 – Infos und Tutorials



Hast du die bereitgestellten Informationen genutzt bzw. die verfügbaren Videos zur Funktionsweise des Lernspiels angesehen? *

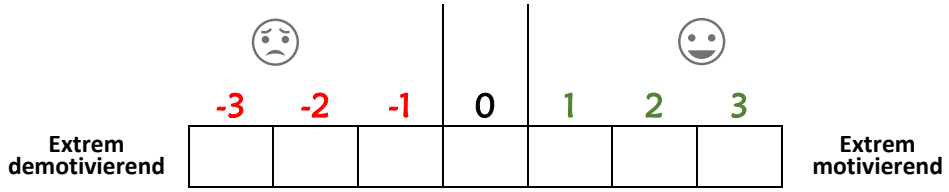
Ja ○ Nein ○

Falls ja, welche Art von Informationen hast du bevorzugt? *

Texte ○ Beide gleich ○ Videos ○

Falls du eine Art gegenüber der anderen bevorzugt hast, kannst du Gründe dafür angeben? (Offene Frage)

Falls ja, wie motivierend war es für dich, bei Bedarf Informationen und Hilfestellungen zum Lernspiel erhalten zu können? *



Warum wurdest du durch dieses Spielelement „Infos und Tutorials“ positiv motiviert/negativ motiviert? (Offene Frage)

C. Meinung zum digitalen Lernen

Möchtest du, dass im Deutschunterricht in der Schule öfters digitale Lernspiele eingesetzt werden? *

Ja  Nein 

Motivieren dich digitale Lernspiele auch außerhalb der Schulzeit Deutsch zu lernen? *

Nein | Eher nicht | Weiß nicht | Eher ja | Ja

Bist du der Meinung, dass digitale Lernspiele deine Deutschkenntnisse verbessern? *

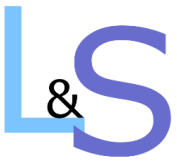
Nein | Eher nicht | Weiß nicht | Eher ja | Ja

Sollten digitale Lernspiele auch in anderen Schulfächern eingesetzt werden? *

Nein | Eher nicht | Weiß nicht | Eher ja | Ja

A.6. Post-questionnaire

Questionnaire about the educational game



Dear study participant,

this questionnaire is designed to find out how you liked the learning game "Lernen&Spielen" and what your impression of digital learning is. Completing the questionnaire is voluntary and totally anonymous. No conclusions can be drawn about your person.

The questionnaire is divided into three sections:

A. **Collection of statistical data about the person**
B. **Impression of the used educational game**
C. **Opinion on digital learning**

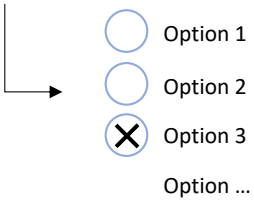
By answering the questions, you are helping me a lot to complete my master's thesis.

Thanks for participating.

Date	School/Organization

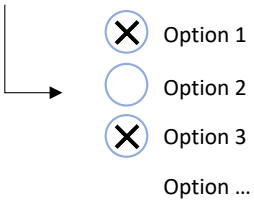
Help for answering the questions

* (Single choice)



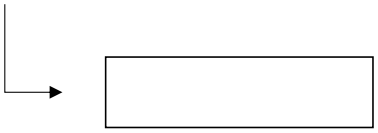
If the question is marked with a * (orange star), only one answer option can be ticked.

* (Multiple choice)



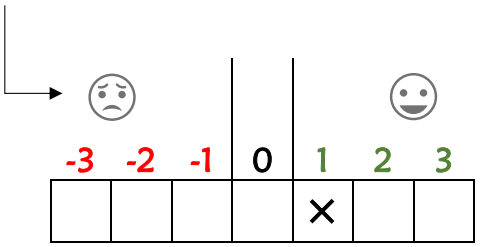
If the question is marked with a * (green star), multiple answer options can be ticked.

Open answer option



This type of answer option allows you to answer the question in your own words.

Scale rating



This type of answer option allows you to indicate whether you perceived something as **positive** (**1 <-> 3**; **green**), **neutral** (**0**; **black**), or **negative** (**-1 <-> -3**; **red**).

A. Collection of statistical data about the person

Please state your gender? *

- male
- female
- diverse

How old are you? *

- younger than 10
- 10
- 11
- 12
- 13
- 14
- 15
- older than 15

B. Impression of the used educational game

How much fun did you have using the educational game? *

No fun at all	Less fun	It was okay	Fun	Much fun
○	○	○	○	○

What did you like most in this learning game? (Open question)

What did you not like that much in this learning game? (Open question)

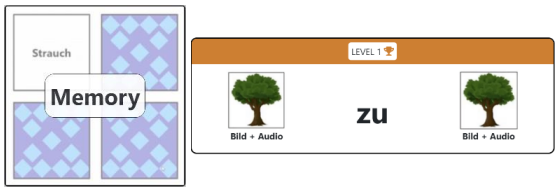
Would you recommend the educational game to your friends? *

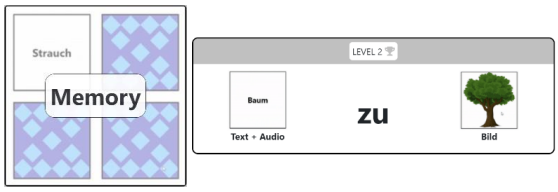
Yes

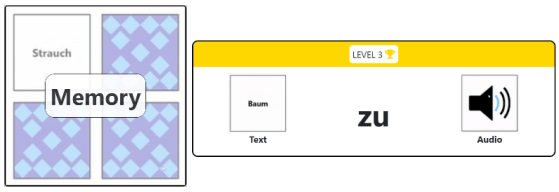
No

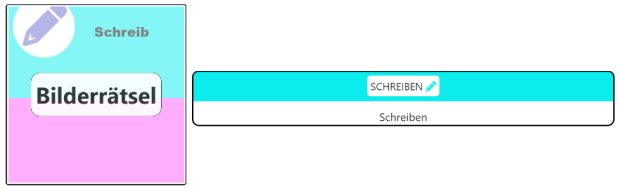
Why would you recommend/don't recommend the educational game? (Open question)

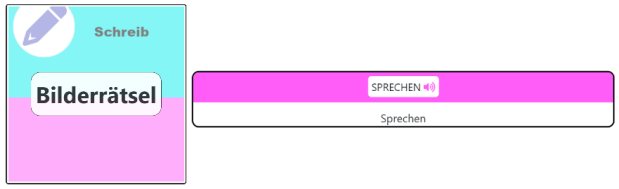
Which game mode would you play if you had to choose one right now? *

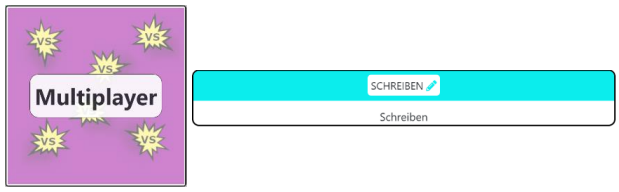


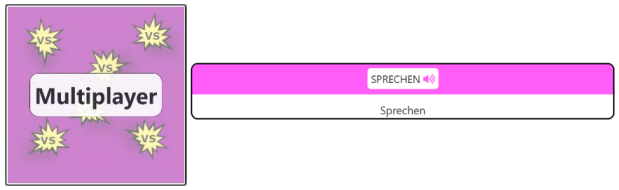












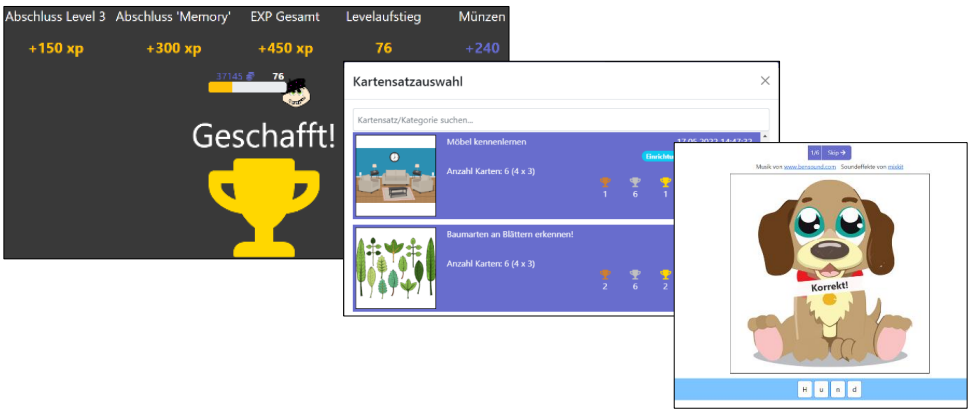
Game element 1 - Avatar

How motivating was it for you to have an avatar representing you in the game? *

	-3	-2	-1	0	1	2	3	
Extremely demotivating								**Extremely motivating**

Why were you positively motivated/negatively motivated by the "Avatar" game element? (Open question)

Game element 2 – Feedback

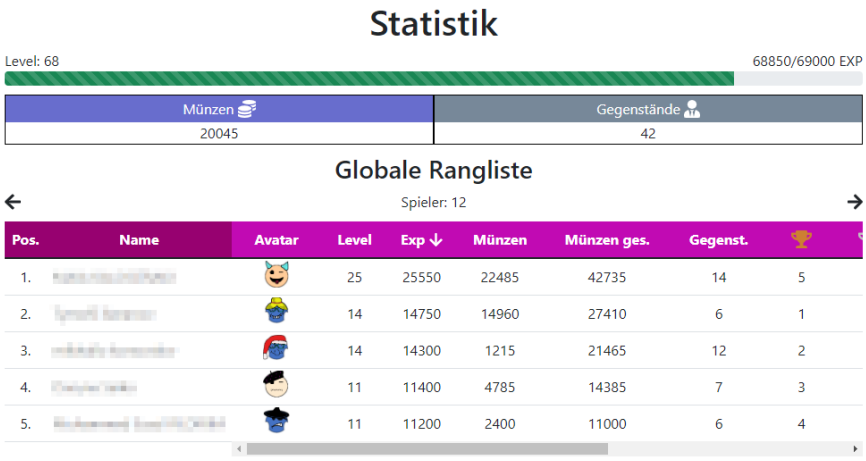


How motivating was it for you to receive feedback while playing? *

	-3	-2	-1	0	1	2	3	
Extremely demotivating								**Extremely motivating**

Why were you positively motivated/negatively motivated by the "Feedback" game element? (Open question)

Game element 3 – Points, levels and ranking

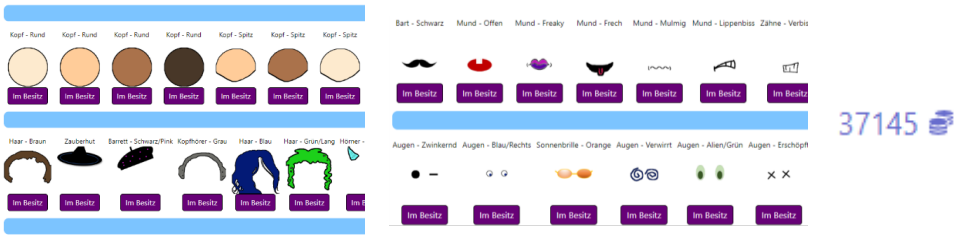


How motivating was it for you to earn points, level up and compare yourself to other players on the leaderboard? *

	-3	-2	-1	0	1	2	3	
Extremely demotivating								**Extremely motivating**

Why were you positively motivated/negatively motivated by the "Points, levels and ranking" game element? (Open question)

Game element 4 – Coins and shop

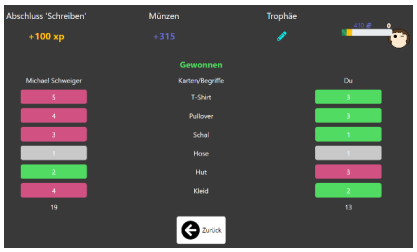


How motivating was it for you to receive coins, which you could then exchange in the store for items to customize your avatar? *

Extremely demotivating	-3	-2	-1	0	1	2	3	Extremely motivating

Why were you positively motivated/negatively motivated by the "Coins and shop" game element? (Open question)

Game element 5 – Multiplayer

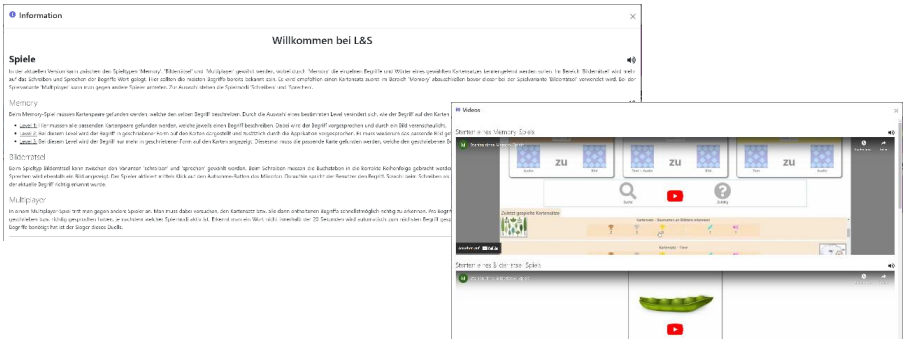


How motivating was it for you to be able to play against your friends or classmates in the multiplayer mode? *

Extremely demotivating	-3	-2	-1	0	1	2	3	Extremely motivating

Why were you positively motivated/negatively motivated by the "Multiplayer" game element? (Open question)

Game element 6 – Info and tutorials



Did you use the information provided or watch the available videos on how the educational game works? *

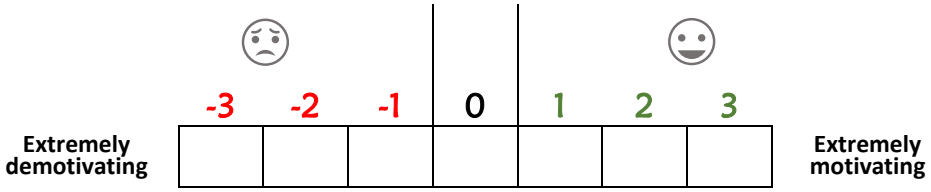
Yes ○ No ○

If yes, what kind of information did you prefer? *

Texts ○ Both equal ○ Videos ○

If you preferred one type over the other, can you give reasons? (Open question)

If yes, how motivating was it for you to be able to get information and assistance about the educational game when needed? *



Why were you positively motivated/negatively motivated by the "Info and tutorials" game element? (Open question)

C. Opinion on digital learning

Would you like to use digital learning games more often in German lessons at school? *

Yes

No

Do digital learning games motivate you to learn German outside of school? *

Not at all | Rather not | Don't know | Rather yes | Yes

Do you think that digital learning games improve your German language skills? *

Not at all | Rather not | Don't know | Rather yes | Yes

Should digital learning games also be used in other school courses? *

Not at all | Rather not | Don't know | Rather yes | Yes

A.7. Pre-questionnaire evaluation summary

Pre-inteview evaluation (GRG 16, Maroltingergasse)		Results		
	A. Collection of statistical data about the person	**total**	**female**	**male**
Q1	Please state your gender			
	male	6		
	female	5		
	diverse	0		
Q2	How old are you?			
	younger than 10	0	0	0
	10	0	0	0
	11	2	1	1
	12	0	0	0
	13	2	1	1
	14	2	1	1
	15	1	0	1
	older than 15	4	2	2
	B. Usage of digital devices			
Q3	What kind of devices do you use more often?			
	Mobile devices (smartphone, tablet, etc.)	8	5	3
	Desktop devices (computer, laptop, etc.)	3	0	3
Q4	How many hours a day do you use digital devices?			
	less than 1 hour	0	0	0
	1-2 hours	1	0	1
	2-3 hours	3	3	0
	3-4 hours	1	0	1
	4-5 hours	4	1	3
	more than 5 hours	2	1	1
	Not at all	0	0	0
Q5	What do you use digital devices for? (Multiple choice possible)			
	playing games	6	2	4
	listening to music	9	4	5
	watching videos	9	4	5
	social networks (Facebook, Instagram, TikTok, Snapchat, Twitter, etc.)	9	5	4
	writing messages (WhatsApp, Telegram, Signal, etc.)	8	4	4
	making calls	9	4	5
	learning	9	4	5
	Others			
	C. Learning German			
Q6	How do you currently leanr Geman? (Multiple choice possible)			
	With the help of digital learning games	4	3	1
	With the help of movies	6	4	2
	With the help of digital learning materials	7	3	4
	With the help of German textbooks	10	4	6
	Through the lessons at school	9	4	5
	With the help of family/parents/siblings	5	3	2
	With friends	5	4	1
	With classmates	5	2	3
	Others			

Q7	Have you ever tried a learning game for German?			
	yes	9	5	4
	no	2	0	2
Q8	If you ever tried a learning game, can you name it? (Open question)			
	Name of the game			
Q9	What did you like most in this learning game? (Open question)			
Q10	What did you not like that much in this learning game? (Open question)			
Q11	Why are you learning German? (Open question)			
Q12	How often are digital devices used in class to learn German?			
	Not at all	1	0	1
	Once a month	2	1	1
	Once a week	3	2	1
	Almost every lesson	5	2	3
Q13	In your opinion, how important is it to be able to speak/read/write German in Austria?			
	Not important	0	0	0
	Rather unimportant	0	0	0
	Doesn't matter	0	0	0
	Important	3	0	3
	Very, very important	8	5	3
Q14	How much do you enjoy the German lessons at school?			
	No fun at all	0	0	0
	Less fun	0	0	0
	It's okay	4	3	1
	Funny	6	1	5
	Very, very funny	1	1	0
Q15	Are you interested in learning German by playing a game on your computer/mobile phone?			
	Not at all	0	0	0
	Rather not	1	0	1
	Doesn't matter	3	1	2
	Rather yes	3	2	1
	Yes, very much	4	2	2

A.8. Post-questionnaire evaluation summary

Post-inteview evaluation (GRG 16, Maroltingergasse)		Results		
	A. Collection of statistical data about the person	**total**	**female**	**male**
Q1	Please state your gender			
	male	6		
	female	4		
	diverse	0		
Q2	How old are you?			
	younger than 10	0	0	0
	10	0	0	0
	11	0	0	0
	12	2	1	1
	13	2	1	1
	14	3	1	2
	15	0	0	0
	older than 15	3	1	2
	B. Impression of the used educational game			
Q3	How much fun did you have using the educational game?			
	No fun at all	0	0	0
	Less fun	1	0	1
	It was okay	3	2	1
	Fun	3	0	3
	Much fun	3	2	1
Q4	What did you like most in this learning game? (Open question)			
Q5	What did you not like that much in this learning game? (Open question)			
Q6	Would you recommend the educational game to your friends?			
	yes	7	2	5
	no	3	2	1
Q7	Why would you recommend/don't recommend the educational game? (Open question)			
Q8	Which game mode would you play if you had to choose one right now?			
	Memory Level 1	0	0	0
	Memory Level 2	1	1	0
	Memory Level 3	0	0	0
	Bilderrätsel Schreiben	3	1	2
	Bilderrätsel Sprechen	1	0	1
	Multiplayer Schreiben	0	0	0
	Multiplayer Sprechen	0	0	0
	Game element 1 - Avatar			
Q9	How motivating was it for you to have an avatar representing you in the game?			
	-3	0	0	0
	-2	0	0	0

	-1	1	1	0
	0	2	1	1
	1	2	0	2
	2	3	1	2
	3	2	1	1
Q10	Why were you positively motivated/negatively motivated by the “Avatar” game element? (Open question)			
	Game element 2 - Feedback			
Q11	How motivating was it for you to receive feedback while playing?			
	-3	0	0	0
	-2	0	0	0
	-1	0	0	0
	0	1	0	1
	1	3	1	2
	2	5	2	3
	3	1	1	0
Q12	Why were you positively motivated/negatively motivated by the “Feedback” game element? (Open question)			
	Game element 3 - Points, levels and ranking			
Q13	How motivating was it for you to earn points, level up and compare yourself to other players on the leaderboard?			
	-3	0	0	0
	-2	0	0	0
	-1	0	0	0
	0	1	0	1
	1	1	0	1
	2	4	1	3
	3	4	3	1
Q14	Why were you positively motivated/negatively motivated by the “Points, levels and ranking” game element? (Open question)			
	Game element 4 - Coins and shop			
Q15	How motivating was it for you to receive coins, which you could then exchange in the store for items to customize your avatar?			
	-3	0	0	0
	-2	0	0	0
	-1	0	0	0
	0	2	0	2
	1	2	1	1
	2	4	1	3
	3	2	2	0
Q16	Why were you positively motivated/negatively motivated by the “Coins and shop” game element? (Open question)			
	Game element 5 - Multiplayer			
Q17	How motivating was it for you to be able to play against your friends or classmates in the multiplayer mode?			
	-3	0	0	0
	-2	0	0	0
	-1	2	0	2
	0	0	0	0

	1	0	0	0
	2	4	1	3
	3	4	3	1
Q18	Why were you positively motivated/negatively motivated by the “Multiplayer” game element? (Open question)			
	Game element 6 - Infos and tutorials			
Q119	Did you use the information provided or watch the available videos on how the educational game works?			
	Yes	1	0	1
	No	9	4	5
Q20	If yes, what kind of information did you prefer?			
	Texts	0	0	0
	Both equal	0	0	0
	Videos	1	0	1
Q21	If you preferred one type over the other, can you give reasons? (Open question)			
Q22	If yes, how motivating was it for you to be able to get information and assistance about the educational game when needed?			
	-3	0	0	0
	-2	0	0	0
	-1	0	0	0
	0	0	0	0
	1	0	0	0
	2	1	0	1
	3	0	0	0
Q23	Why were you positively motivated/negatively motivated by the “Info and tutorials” game element? (Open question)			
	C. Opinion on digital learning			
Q24	Would you like to use digital learning games more often in German lessons at school?			
	Yes	7	2	5
	No	3	2	1
Q25	Do digital learning games motivate you to learn German outside of school?			
	Not at all	0	0	0
	Rather not	3	1	2
	Don't know	2	0	2
	Rather yes	2	1	1
	Yes	3	2	1
Q26	Do you think that digital learning games improve your German language skills?			
	Not at all	0	0	0
	Rather not	1	0	1
	Don't know	3	0	3
	Rather yes	5	4	1
	Yes	1	0	1
Q27	Should digital learning games also be used in other school courses?			
	Not at all	0	0	0
	Rather not	0	0	0
	Don't know	3	2	1
	Rather yes	3	0	3
	Yes	4	2	2