Mobile and Gamified Blended Learning for Language Teaching – Studying Requirements and Acceptance by Students, Parents and Teachers in the Wild

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ABSTRACT

While mobile gamified apps for language learning such as Duolingo are highly successful, knowledge about the use and suitability of such concepts for blended learning in schools is scarce. Pursuing a holistic approach, this work investigates the general requirements and acceptance of a modern gamified learning companion for traditional class-based teaching. We conducted several surveys with students, teachers and parents and studied the usage of a custom research prototype by 13/14-year-olds in three classes in English (as a foreign) language under real-world conditions. According to our results, all considered involved parties are positive about such a mobile learning companion when specific requirements are met. We did not observe any community-related negative impact such as teasing for bad results, for example, and conclude that the considered gamification features such as challenges with classmates and rankings are suitable for the investigated school context. Based on the results, we derive a set of guidelines for the design and development of a mobile learning companion, its introduction in class and its practical usage.

ACM Classification Keywords

H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous; K.3.1. Computers and Education: Computer Uses in Education - Distance Learning

Author Keywords

Mobile learning; blended learning; gamification; field study.

INTRODUCTION

With the widespread use of smartphones, the concept of mobile learning, i.e. anytime and anywhere available learning mediated via handheld devices [20], has become a reality in only a few years. Educational apps for language learning belong to the most successful mobile applications in respective app stores with dozens of millions of downloads for popular apps such as *Babbel*, *busuu* or *Duolingo*. These visually appealing applications typically make use of gamification features such as competitions with friends or virtual badges and awards to keep learners motivated (see Figure 1).

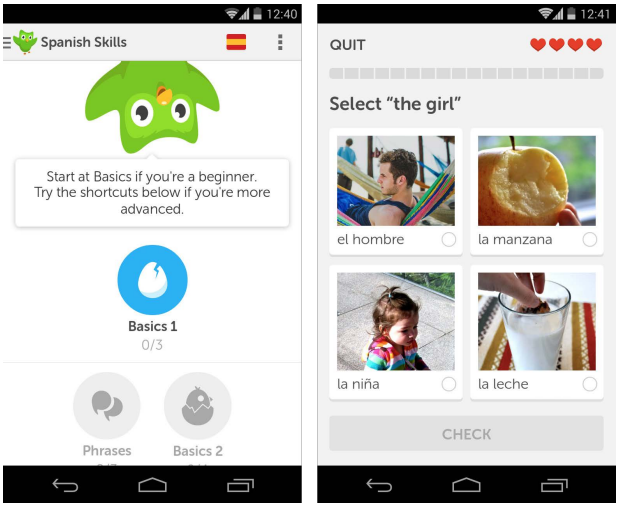

Figure 1. ***Duolingo*** **as an example for a modern gamified app for language learning. Its features include vocabulary quizzes, game-like lives in form of hearts, levels and progress bars, for example.**

Recently, we observe the increasing interest in using such mobile gamified apps for blended learning in schools. Blended learning refers to the combination of computer-mediated instructions with face-to-face instructions [4], typically traditional classroom teaching. This allows students to repeat previously heard teaching subjects or deepen their knowledge with additional exercises in a location- and time-independent manner. For example, a respective platform is *Duolingo for Schools* [1] which provides a dashboard for teachers to track the progress of their students using the Duolingo app.

While prior studies indicate the general effectiveness of mobile gamified apps for language learning (cf. [30, 32]), several aspects of applying such an application as an extension of traditional classroom teaching under real-world conditions are unclear. What are the requirements and expectations of the involved parties, i.e. students, teachers and parents? How should common social features of such apps be applied or

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[1] https://schools.duolingo.com/

adapted for the classroom community? Under what conditions would such apps be accepted by the mentioned parties?

In this paper, we present a comprehensive study on applying a modern mobile gamified app as companion for traditional classroom lessons in English language. We carried out a set of inquiries with German-speaking students from three secondary school classes, their teachers and parents. To further investigate the acceptance of such a learning companion, we conducted a field study with a custom learning app featuring advanced social functionalities to utilize the class community.

The contribution of this paper is twofold. First, we present a fully functional research prototype with modern features for exploring research aspects on blended learning in the field. Second, derived from the study results, this paper contributes a set of guidelines for the design and development, the introduction as well as the practical usage of modern mobile apps for supporting traditional language teaching in schools.

FUNDAMENTALS AND RELATED WORK

This section gives an overview of fundamental prior research and relevant related work in the fields of mobile learning, micro learning and gamification in an educational context.

Mobile Learning

Widespread availability and increasing capability of mobile devices and cellular connectivity have enabled new forms of mobile learning independent of time and place [21]. Mobile learning can be employed for both distance learning [19] and blended learning [25], where traditional learning in class is supplemented by mobile learning outside the classroom. While mobile learning is often characterized as a natural progression from traditional e-learning, it should be considered as its own technology with its own terminology [19]. In contrast to e-learning, mobile learning facilitates access to learning materials using mobile technologies from any place at any time. In addition, mobile devices provide the capability to deliver location-specific information to learners. Seppälä and Alamäki [28] claim that "[t]he core characteristic of mobile learning is that it enables learners to be in the right place at the right time, that is, to be where they are able to experience the authentic joy of learning." This allows learners and instructors to efficiently utilize their spare time and to enable just-in-time learning, assisting learners when they are faced with a problem and seeking knowledge and guidance. In a mobile learning environment, learners are responsible for autonomous learning, collaboration and exchange with others. Teachers and instructors assume the role of experts who are responsible for providing appropriate information, resources and an environment for learning [25]. They need to be familiar with the interests of learners, connect those interests with learning goals and provide opportunities for learners to reach these goals. In addition, instructors in a mobile learning environment must be qualified to use the required mobile technologies and provide guidance and support when problems arise.

One popular application of mobile learning technologies is Mobile Assisted Language Learning (MALL) [20]. For example, the popular example *Duolingo* uses game design elements such as points, badges, levels, progress bars, avatars and virtual currency. While Duolingo supports its use in schools, the capabilities afforded to teachers are limited in freedom and flexibility. Study results show promise for MALL applications to augment formal school learning [27], however, a long-term case study [23] revealed several challenges such as significant time demand on teachers, technical issues, the need for professional training and dedicated support staff. In addition, MALL applications have been found to lack support for synchronous learning activities and to underutilize learner-to-learner collaboration [18, 20].

Micro Learning

Micro learning refers to learning in small units and short amounts of time [15] through a combination of micro content delivery and a series of micro interactions [5]. In micro learning both scope of content and interactions are reduced to a minimum. Mobile technologies are predestined for the delivery of micro learning content as they facilitate autonomous and ubiquitous access to focused, contextually relevant digital learning content (cf. [10]). Micro learning breaks content into small chunks with a high level of interaction and immediate feedback [5]. Decker, Wesseloh and Schumann [7] define a number of didactic requirements when designing mobile micro learning applications: learning content must be focused and reduced to a minimum (indivisibility), but contain all relevant information to fulfill a given task (coherence). Applications should facilitate didactic interaction and provide constant and immediate feedback. Learners must be aware of the learning goals and topics should be tailored to individual learners. In addition, self-assessment of prior knowledge allows the difficulty of tasks to be adjusted to the individual learner. Variety in media formats and task types are required to increase the learner's motivation. If tasks prove too challenging, learners should be offered assistance and individual learners should be able to communicate with and help each other. Finally, mobile micro learning should facilitate incidental learning at any place and any time. Therefore micro learning tasks should be comprehensible and achievable despite interruptions.

Gamification in Education and Learning

A recent trend in mobile learning applications is the use of gamification techniques [9, 6]. Gamification is defined as "the use of game design elements in non-game contexts" [8] to produce desired psychological and behavioral outcomes [12]. Rather than simple addition of game elements, it has been argued that gamification should be understood as a holistic, creative and structured process [14, 16]. Gamification in education can increase the motivation and engagement of learners[24], improve learning outcomes, foster socialization among learners or induce behavioral change [6]. Collections of suitable gamification elements have been assembled in related work [22, 26, 31] and a recent study by Dicheva et al. found the most common gamification elements in education to be points, badges and leaderboards [9]. Points can be used for visualizing progress towards a goal, while badges and leaderboards foster competition, and all three game mechanics can serve as status symbols [9]. Badges can also fulfill the function of instructing learners about possible further activities,

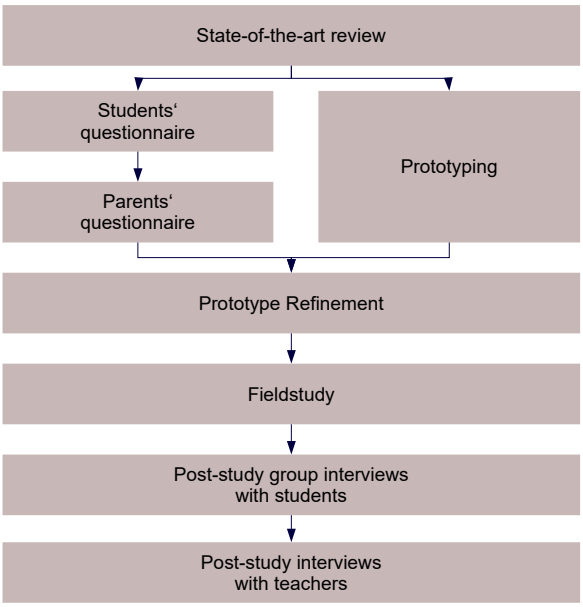


Figure 2. Chronological sequence of our research: The activities started with a state-of-the-art review and (online) surveys with students and parents. The results were incorporated in a functional prototype which was evaluated in a field study. Finally, we documented experiences and gathered feedback from students and teachers in (group) interviews.

for visualizing past activity and supporting group identification [1]. However, not all gamification elements are equally suited for different player personality types [24, 29]. Different models to classify player personality types exist [3, 11, 13] and we have chosen to use the personality types described by Bartle [2]: achiever, explorer, socializer and killer. Bartle characterizes players depending on whether they act or interact during a game session and whether their (inter)actions are primarily directed at other players or the game environment. According to Bartle's model, achievers are primarily focused on attaining status and achieving goals, explorers are focused on exploration and discovery of the unknown, socializers are focused on socializing and networking and killers are focused on winning and direct competition. Therefore killers might be more strongly motivated by the competitive nature of leaderboards, while explorers might be more strongly motivated by the discovery and collection of badges.

METHOD

To gain a holistic understanding of the real-world requirements and acceptance criteria of a gamified app for blended language learning, we applied complementing research methods and conducted experiments with students, teachers and parents. Figure 2 depicts the single steps in our research. As the basis for the subsequent work, we started with a state-of-the-art review including a scientific literature survey as well as an analysis of current features of the two popular learning apps *Duolingo* and *Babbel*. Following, we designed an online questionnaire (using *Google Forms*) for students to learn about their mobile device usage behavior in general, their experience with publicly available learning apps and favored features of an appropriate app complementing their classroom lessons.

Additionally, we created a paper questionnaire for the parents of the students participating in the later field study. Since the students were minors, it was necessary to obtain their parents' permission for taking part in the experiment. We distributed respective permit notices in the participating classes to be signed by the parents of the involved students. This permit notice included the short questionnaire and could be easily detached from the sign part to ensure the author's anonymity. It contained questions regarding the communication between the parents and their children's teachers (e.g., concerning the children's school exercises), whether their children possess mobile devices, the parents' own experiences with learning apps and their attitudes towards a mobile learning companion and requirements and conditions for approving its use.

At the same time, we started designing and implementing the fundamentals of the mobile research prototype such as creating database structures and setting up login screens and first webpages to display vocabulary lists, etc. Results of the questionnaires such as app features favored by the participating students were then considered in a major refinement and extension of the prototype. The final prototype (in three different versions with varying functionality) was made available for three secondary school classes (with students aged between 13 and 14 years) within the scope of their English lessons. During the five-week field study we collected anonymized log data to evaluate the students' interactions with the app.

Finally, we conducted concluding post-study group interviews with the participating students (one group interview per class) to reflect on the experiences with the mobile learning app. In addition, we talked to five teachers to learn about their requirements for and experiences with such a learning companion.

Following this method, we were able to achieve a comprehensive picture on the requirements and acceptance criteria for complementing traditional classroom teaching with a modern mobile learning app.

STUDENTS' QUESTIONNAIRE

We designed the questionnaire for students as an anonymous online questionnaire and distributed it via email, various social networks (*Facebook*, e.g.) and messengers (*WhatsApp*, e.g.) to interested students and young adults. Our questions focused on the current usage state of learning applications in and out of school, positive aspects of current solutions, as well as potential features the participants would like to see in an app accompanying classroom teaching.

Participants

We received 62 completed questionnaires, the participants (36 male, 26 female) were aged between 13 and 28 (mean=17.2, median=18.3).

All of the participants own at least a smartphone. 32% additionally own a tablet. 95% of the participants have a mobile data plan, the other 5% access the Internet through Wifi connections. All of the participants estimate their daily device usage at 45 minutes at least, 79% at more than 90 minutes. The most used apps and functions include *WhatsApp* (100%), *Facebook* (63%) and making phone calls (58%).

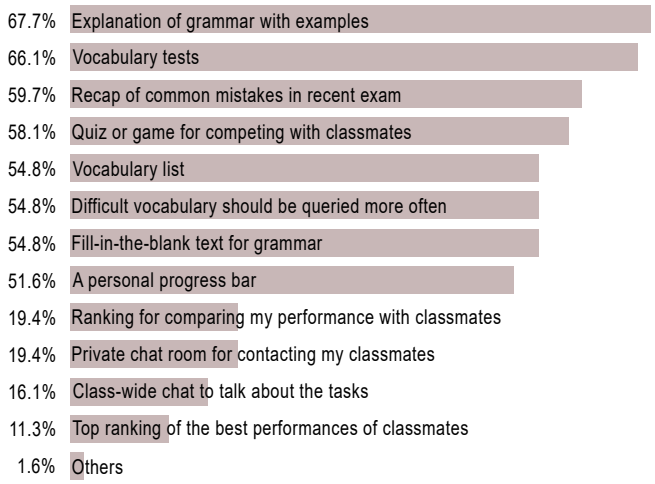


Figure 3. Results of the students' questionnaire: The percentage of participants who would like to see a specific feature in a mobile companion for language learning to complete classroom teaching.

64% of the participating students stated that their English teachers have involved some kind of software for their teaching at least once. Typical examples include administrative applications such as *WebUntis*, a digital class register, and office software such as applications of the *MS Office* suite. Only 3 participants stated that their teachers have made use of software to support learning, in this case *kahoot*, a customizable quiz game. The mentioned applications are mainly used during school lessons (92%) and at home (67%).

Results

39% of the participants had tried a mobile learning app (in their sparetime, independent of school) at least once. We clustered the participants' statements with regard to the used learning applications through a qualitative content analysis with open coding and found the following categories of positive aspects. Concerning the *exercises*, the participants liked the auditive and visual interaction, the reminders for learning, as well as the repetitions of previously incorrectly answered questions. With regard to the *difficulty*, the participants mentioned the importance of meaningful and understandable exercises. Further, the participants appreciated the applications' *user interfaces* and were fond of the visually appealing design, the thematic structuring as well as the gamification approaches with levels and progress indicators.

However, only 37% of the participants, who had used a learning app at least once, still actively used such an application. As reasons for quitting, participants mentioned the complexity of the software (*"The application is too complex to be used on a smartphone"*), missing topical connection to the respective school lessons (*"The available themes did not match the topics of my lessons.'*), as well as insufficient variety of tasks (*"I rarely get any new tasks. The variety is not sufficient to keep me engaged."*).

Figure 3 shows favored features of a mobile learning app as mentioned by the participating students (selected from a list or filled in, if not available). The most preferred features are *Explanation of grammar with examples* (mentioned by 68%) and *Vocabulary tests* (66%). Further relevant features include *Recap of the common mistakes in a recent exam* (60%), *Quiz or game for competing with my classmates* (58%) and a *Vocabulary list for learning on the go* (55%). Among the least mentioned features are a *Ranking for comparing my performance with classmates* (19%), a *Private chat room for contacting my classmates* (19%), a *Class-wide chat room* (16%) and *Highlighting the best performances of classmates* (11%).

PARENTS' QUESTIONNAIRE

The questionnaire for the parents was distributed in paper form to the parents of the students participating in the later field trial. It focused on the parents' attitudes towards learning applications, especially their potential usage in school teaching.

Participants

We received 35 completed questionnaires from parents. 46% of them stated to have used software for language training at least once, 14% still use a respective application. Each of the participants' school-aged children owns a smartphone. As main arguments for the purchase, the parents mentioned constant availability, social connectivity and social pressure.

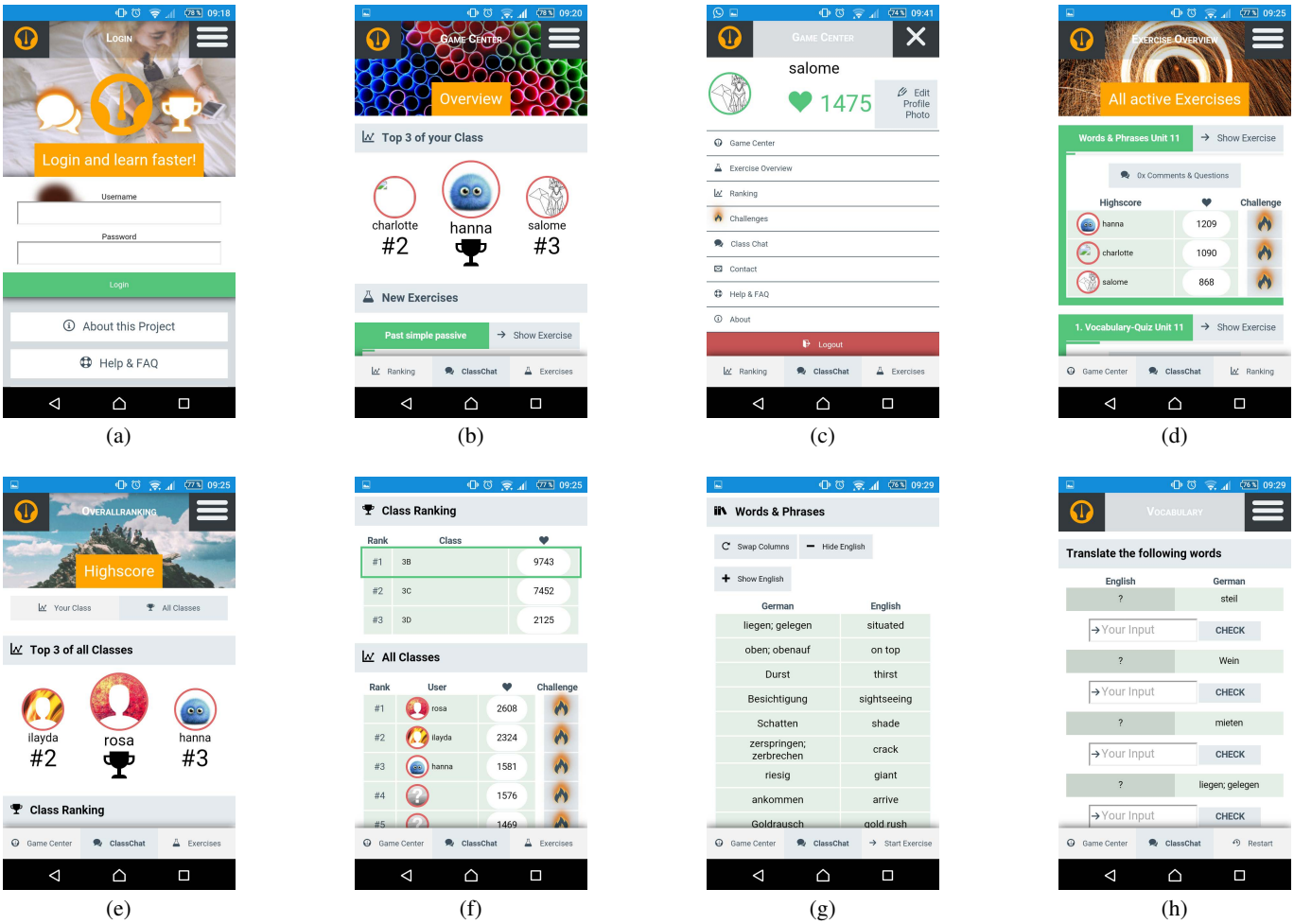
Results

We clustered the participants' opinion on using mobile devices in language lessons into the three groups *positive* (usage is positive, no concerns), *potentially* (usage can be positive, certain conditions required) and *negative* (usage is negative, should not be done). 29% of the participants had a positive, 14% a negative attitude towards the integration of a mobile learning application in their children's language classes.

The remaining 57% saw the use of mobile technology as conditionally positive, yet linked to certain requirements. Several parents proposed that the mobile apps should be used as extension of the traditional classroom teaching, yet only outside the classroom (*"The mobile devices should not be allowed during the lesson itself."*). Others expected mobile apps to be well-suited for some educational content, yet not the entire syllabus (*"[With mobile software] Certain topics might be imparted better and more easily."*).

Performing open coding, we clustered the parents' statements and requirements into four main groups:

- **Clear usage rules.** Several parents demanded the definition of usage rules for using mobile learning apps within the school. (*"I'd like to have clear usage rules, especially defined times, when usage is allowed."*)
- **Concrete tasks.** The tasks should be concrete and clearly related to the classroom teaching. (*"I think the tasks should be concrete, potentially timely restricted and only a supplement to the classroom lessons."*)
- **Social fairness.** It must be ensured that each student of a class using such a learning app has access to a respective device and thus, has the chance to participate. (*It's unpleasant, if two or three students could not participate because their parents aren't able to afford smartphones."*)



(a) (b) (c) (d)

(e) (f) (g) (h)

Figure 4. Central features of our research prototype: start and login screen (a), game center (b), app menu (c), exercise overview with status (d), ranking overview (e), class ranking (f), vocabulary overview (g) and test (h).

- **Distraction/Safety.** In case the students use their private smartphones for such a learning app extending classroom teaching, the parents would like to prevent switching to other applications to avoid distraction and ensure safety. (*"An available device can be used if it can be guaranteed that the students use the devices only for educational matters and do not navigate to any other Web sites."*)

RESEARCH PROTOTYPE FOR BLENDED LEARNING

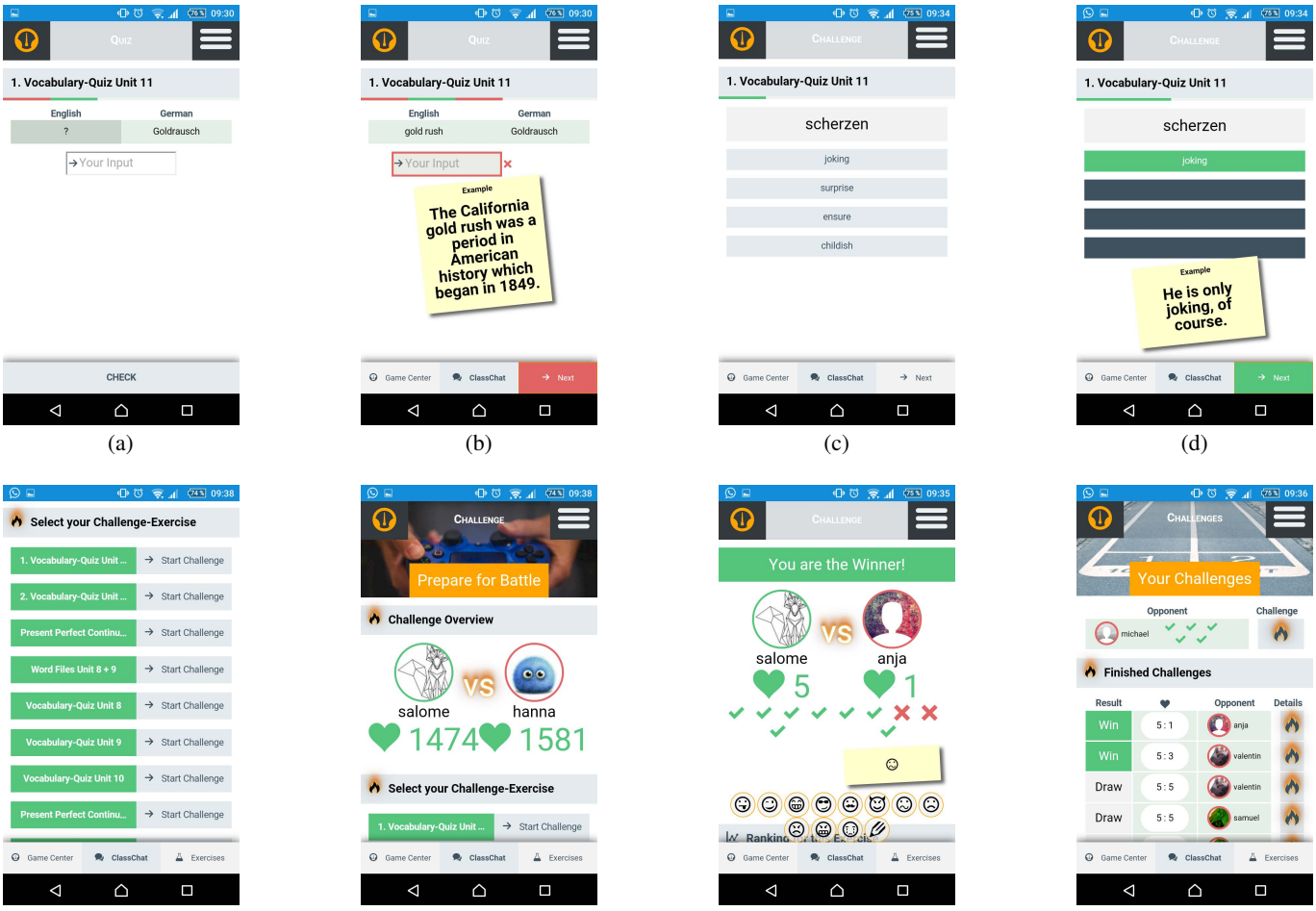
In the following, we describe the development and the features of our research prototype. It represents an extensive, customizable platform for testing mobile blended learning features with various logging functionality. Its functionality is inspired by current publicly available solutions for mobile learning such as *Duolingo* and results of our previous surveys.

Design and Implementation

We implemented our platform as a dynamic Web application utilizing HTML, JavaScript, PHP and MySQL. By using Web technologies, we could make the application easily available from any recent smartphone with a modern Web browser without the need to implement several native mobile apps for today's most popular mobile operating systems. Following responsive design guidelines, we offered an optimized layout adapted to the screen size of the requesting device. Further, we ensured that the application could also be used on a computer by students who did not own a suitable smartphone. At first usage, the participants had to login using a username and password (both provided to each student by a study assistant during the introduction in the class).

As tasks, we implemented vocabulary lists, quizzes, a competition mode to challenge classmates as well as a practice test to assess the knowledge concerning all available task packages. Task packages correspond to learning units and consist of several single tasks. They were activated, i.e. made visible for the participants, in accordance with the teaching progress and in consultation with the teachers. At the same time, the students' parents were informed about the availability of the new task package via SMS and email.

By integrating *Google Analytics* and a custom logging mechanism, we could record each interaction with the application, i.e. logins, taps on links and buttons as well as screen visit times.



(a) (b) (c) (d)

(e) (f) (g) (h)

Figure 5. Further prototype features: quiz with free text entry (a) and sample sentence (b), multiple choice quiz (c) and sample sentence (d), unit selection (e), start of challenge mode (f), results of the challenge (g) with the opportunity to send an emoji and overview of the user's challenges (h).

Features

Figure 4a depicts the start screen upon opening the Web application. Aside from the opportunity to login, users could find links to information on the prototype and the conducted study, FAQ and support information, contact information, etc. After a successful login, users were presented the "Game Center" (Figure 4b), a overview dashboard containing the top three players, the tasks of the current task package and (if applicable) a list of open requests for challenges.

Each screen shows the application logo in the top left, a tap on it brings the user back to this overview screen. A tap on the icon in the top right shows the app menu (Figure 4c) including information on the user profile such as the user's game score and an editable profile image. Further, each app screen features a contextual bottom bar which showed shortcut links to commonly used features. For quick access, the middle button always leads to the chat function.

Figure 4d shows the exercise overview containing all task packages currently activated for the respective user. Below each task title a bar indicated the number of correctly completed questions. Further, for each task the top three classmates and their current scores were displayed. The colored border around the players' profile images showed whether the player has been online recently: green means that the user has been using the application within the last 10 minutes (red means she has not). Tapping the flames icon, a player could be challenged.

The ranking overview is depicted in Figure 4e. In addition to the classmates of the current user, the user could also see a class ranking. This view (Figure 4f) showed a comparison of the overall performance of the students of the participating classes as well as as an individual performance ranking of the users. Only the top three players were shown with nickname and profile image, further players in the ranking were anonymized. If the current user was not one of the top three players, his or her position was highlighted in the ranking.

Vocabulary

Each task started with short instructions for the following task (e.g., "This task contains vocabularies from unit 11 of the textbook. Start the task and translate the words!"). In case of a vocabulary task, the following screen shows a list of German words and their English translation (Figure 4g). For learning purposes, the list supports swapping the columns and hiding

one of the two columns. By tapping the button "Start Exercise" users can start the interactive vocabulary test (Figure 4h). All words are shown in random order and the respective translation needs to be entered in the corresponding textfield or selected from four choices. A tap on the button "Check" validates the user's entry (case-sensitive, redundant spaces removed): a correct answer is worth one point, an incorrect answer reduces the user's score by one point. Right after validation an exemplary sentence demonstrating the usage of the word is displayed (comprehensible examples were the top-rated feature in our student survey).

Quiz

The second task type, the quiz, is depicted in Figure 5a. Each quiz consists of five translations to be entered consecutively. Again, for each correct answer (equal validation as for the vocabulary tests) one point is earned, for an incorrect one, one point is lost. Also in the quiz, a sample sentence is displayed after validation (Figure 5b). After the final translation, the end result as well as the user's position within the task ranking is shown.

Challenge

The user can challenge another player (i.e. classmate) by tapping the corresponding icon in a ranking list. In the following screen (Figure 5f), the names and scores of the two opponents are shown (in this case "salome" vs. "hanna") and the contender can select an exercise for this challenge (Figure 5e). Challenges consist of five translation tasks including free text entry (similar to the vocabulary test/quiz) and multiple choice answers (Figure 5c). Again, a success bar shows the (in)correctly answered tasks and a sample sentence is shown after each task (Figure 5d). After both opponents have completed the challenge, the application shows the final result with points calculated as mentioned above (Figure 5g). Optionally, the players can leave a short text message or an emoji for their opponent. An overview of open and completed challenges including available end results (Figure 5h) is available from the application's main menu.

To avoid the improper restart of tasks (in case of a difficult first question for example), a stake of one point is used when a task is started.

FIELDSTUDY

In the following, we describe our field trial where we employed our research prototype in the wild.

Participants

We conducted the fieldstudy with three third-grade classes (3B, 3C, 3D) of an academic secondary school in Vienna, Austria. The prototype was made available in the respective classes for about five weeks (begin of May to mid-June) and was linked to their English lessons. The 39 participating students were aged between 13 and 14 years. Typically, English is their first foreign language and they possess basic knowledge of the language.

The students and the teachers are familiar with a Web-based learning platform (named "Cyber Homeworks"), which is provided by the school for the English lessons. The tasks are simple text entry or multiple choice exercises. The students' progress can be monitored by the teacher. The platform is targeted at desktop computers, a related mobile learning app is not available. Further, "Cyber Homeworks" does not feature any social elements for comparing or interacting with classmates online.

To investigate the participants' responses towards novel features of our prototype, we prepared three prototype versions with slightly different feature sets for the participating classes. *Condition 1* (available for class 3D) contained the functionalities vocabulary list, test, quiz, rankings, class chat and comments, yet no challenge mode to compete with classmates. *Condition 2* (available for class 3C) provided the functionality of Condition 1 plus the challenge features. Finally, *Condition 3* (available for class 3B) had the features of Condition 2 and further allowed for sending a text message and/or an emoji to an opponent after completing a challenge.

In advance, the content of the task packages was created in cooperation with one English teacher (who was responsible for all three classes) and coordinated with the teaching subjects in the defined study phase (compilation of suitable vocabulary lists from the textbook, for example). In accordance with the teacher, task packages with new content were published by a study assistent after the corresponding English lesson.

Results

As described above, we logged each of the participants' interactions with the application. Overall, we collected more than 44,000 interaction datasets from 35 participants. Four students did not use the application once.

Table 1 shows the classes' interactions with the application. To gain insights into the perception of different feature types, we grouped the available features into competitive, social and success-oriented ones (according to popular gamer archetypes, cf. [2]). For example, competitive features include starting a challenge or viewing rankings; social features include sending a chat message or an emoji; success-oriented features include starting a quiz or opening a vocabulary overview. Note that these groups are not distinct: several features (starting a challenge as a competitive and social feature, e.g.) belong to two or three categories.

Class 3D used the application least by far: only 4,939 interactions were logged in comparison to 21,359 (3B) and 17,869 (3C). The limited social features available in class 3D (class chat and comments) were almost ignored and used only twice throughout the entire field study. In contrast, 2,840 social interactions were recorded in class 3C and 7,413 in class 3B. Further, we logged only 2,295 competitive interactions for class 3D, yet 9,878 ones in class 3C and almost 18,000 in class 3B (i.e. 84% of the entire interactions of the class were of competitive nature).

Table 2 shows the points collected by the classes as well as the number of correct answers and the corresponding success quote. Class 3B scored most points (9,741 with 11,041 answers given), followed by class 3C (7,453 with 9,583 answers given) and class 3D (2,125 with 2,777 answers given). 3B also had the highest success rate (88% in comparison to 77/78%).

Class	Sum	Competitive	Social	Success-or.
3B	21,359	17,952 (84%)	7,413 (35%)	20,882 (98%)
3C	17,869	9,878 (55%)	2,840 (16%)	17,719 (99%)
3D	4,939	2,295 (46%)	2 (0%)	4,894 (99%)

Table 1. Number of interactions with the prototype per class. According to their nature, the features were grouped into the categories competitive, social and success-oriented.

Class	Points	Answers	Correct
3B	9,741	11,041	88%
3C	7,453	9,583	78%
3D	2,125	2,777	77%

Table 2. Points collected by the participants per class as well as the overall number of answers given in quizzes and percentage of correct answers.

POST-STUDY GROUP INTERVIEWS WITH STUDENTS

To gather feedback on the app and the students' experiences during the field trial, we conducted post-study group interviews.

Participants

All students of the three classes, which took part in the field study, participated in post-study interviews. The three group interviews were conducted in a semi-structured manner in the respective class rooms.

The students' statements were summarized and grouped into positive and negative aspects as well as general remarks (regarding the prototype, tasks, organization, etc.) and written down on the chalkboard in summarized form. Afterwards, we performed a qualitative content analysis on the collected data, both positive and negative feedback.

Results

The statements could be grouped and summarized as follows:

- **Learning success.** The students appreciated the available features vocabulary lists, quizzes and the challenge mode for learning vocabularies and grammar. (*"It's really cool and a help for vocabulary tests"*, *"I used it several times when preparing for the latest exam"*). They especially highlighted the positive effect of the vocabulary exercises which repeated certain words as well as the variety in comparison to "Cyber Homeworks" application currently provided by the school. Several students assumed that they had learned a lot in only a short time frame.

- **Social factors.** The students perceived the ranking lists and the opportunity to compare their own performance with the ones of classmates as motivating and engaging. Further, they described using the app as fun and addictive.

- **Mobility.** The freedom of location was highly appreciated by the students. They stated to have used the application at both school and home, but also during daily commute.

- **User interface.** The students overall liked the user interface of the evaluated application and especially emphasized the relevance of its clear structure and easy-to-follow navigation.

- **Features and game mechanics.** Features well-perceived and highlighted by the students include the interaction with fellow students in challenge mode and the immediate display of the correct answer including a sample sentence after user input. As a negative aspect several students mentioned the strict vocabulary check: entered translations were only counted as correct if the spelling was entirely accurate. They suggested to apply a more tolerant check. (*"When you're learning vocabulary, you study the words and take less care for upper and lower case or spaces. The normal vocabulary tests aren't so strict either, you are allowed to forget a comma."*)

- **Communication and organization.** Due to organizational constraints, the study was conducted in the second half of the summer term. Several students found this too late (and too close to the holidays, respectively) and said their interest in the application was reduced after the final exam. (*"When there's no exam or test, nobody learns."*). For informing about newly available exercises, the students suggested to use push notifications and messenger services such as *WhatsApp*.

- **Technical aspects.** Several students mentioned the implementation as a Web app as a drawback since they could only use the application when being online. A native application seemed favorable to them. (*"I would have used it more often, but my Internet plan was used up."*). Another consequence of the Web-based implementation was the missing icon in the system's application directory or homescreen (in contrast to a native app). (*"After some time I forgot that I could use this application. If it was a [native] app, it would be more apparent and remind me to use it every now and then."*). One participant experienced some lagging animations due to his outdated smartphone.

POST-STUDY INTERVIEWS WITH TEACHERS

To learn about the teachers' attitudes regarding a mobile companion app for their classroom teaching, we conducted post-study interviews with the involved teacher and additional colleagues.

Participants

All participants were female and aged between 28 and 49. According to their statements, all of them had no or almost no experience of their own in using a modern mobile app for language training. One was involved in the field study, the others were briefed about the evaluated application and its features.

Results

All teachers were in favor of using a mobile application to supplement their traditional language classes and agreed that such an application might be received favorably by their students (*"I can imagine the success of such an app since the youths*

spend a lot of time with their smartphones", *"I assume that this modern form of exercises is more fun for the students than the traditional home assignments."*).

Following a qualitative content analysis and open coding, the statements regarding necessary conditions for introducing and using a mobile learning app in their classes were grouped as follows:

- **Organizational Requirements.** It must be assured that all students have access to suitable smartphones or tablets. If a student does not own a respective device, it should be temporarily provided by the school. Again, to enable the app usage for all students, free Wifi access should be provided by the school.
- **Technical Requirements.** The teachers should not be responsible for maintaining the involved software or hardware. In general, the used app should run as flawlessly as possible to not interrupt students during their tasks and impact the learning success.
- **Usage Regulations.** During class-time, the students should be allowed to use the devices and the app, respectively, only in strictly defined time frames. Further, the teachers should be able to control access to Web sites and apps. They see the risk of distraction in class, if the students could use devices and arbitrary apps without any timely restrictions.

Regarding competitive app features exploiting the class community, the interviewed teachers were generally positive. None of them had respective negative remarks. Three teachers assumed that such features might be especially relevant and fun for students in primary level (typically aged between 11 and 13). Further, they highlighted the importance of fairness and that manipulation by students must be absolutely prevented.

GUIDELINES

Based on the results of our surveys and the field trial, we derived a set of guidelines for developing, introducing and integrating a mobile learning application into traditional class-based language teaching.

Design and Development

Motivating competition. Competitive approaches exploiting the class community are an effective and useful approach to engage students and foster class dynamics. The participants of our trial did not report on any community-related issues such as teasing or even mobbing due to bad results. We conclude that quizzes and challenges are suitable for the special settings of class communities.

Social interaction. Enabling quick communication among the participants (e.g. visualizing feelings by using emoticons) proved to be relevant for the students to foster their motivation and effectively use the application. Yet, basic chat functionality does not need to be part of a mobile learning application since the students use their usual mobile messenger services.

Mobile notifications. In order to make students aware of newly published content and/or send them regular reminders for learning, notifications should be employed. Such notifications need not necessarily be part of the application, but might also be sent using a regular mobile messenger.

Adaptability. For the simple and convenient integration of such an app with class-based teaching, the platform needs to allow for creating and editing task content (such as vocabulary lists for quizzes) as well as the publishing of task packages to individual classes.

Explaining answers. While students can ask for further explanations during lessons, a mobile app needs to provide comprehensive feedback or to provide context for an answer in a quiz. For example, showing a sample sentence for a word in a foreign language was highly appreciated by students.

Introduction

Universal access. In our field study (conducted in Central Europe), we observed the comprehensive penetration of smartphones (with plans including Internet access) amongst the 13- and 14-year-old participants. Providing the mobile learning application in form of a responsive Web application proved successful to support the broad variety of available devices ranging from low-cost to high-end phones. Further, students with prepaid plans and used up data volume can access the application from desktop computers.

Hands-on training. Instead of verbal explanations and presentations of the application, hands-on training with an experienced user (in our case the test assistant) during the first session proved successful. Simple technical issues, which could have led to frustration, could be solved immediately.

Security and privacy briefing. Involved persons such as students, teachers and parents demand information on hazards and risks of using a provided learning application. In order to address such concerns, a security and privacy briefing is important to explain whether personal data is collected, where and how it is stored and analyzed and who has access rights.

Support. For questions regarding the learning app, teachers are the obvious first contact persons for the students. Thus, teachers should get dedicated training in using the application to be able to give support. However, for in-depth questions and trouble shooting, technical experts need to be available. One possibility is to appoint an employee of the school's IT administration, another one is to establish peer support by technology-affine fellow students (see also "Practical Usage").

Quick access. Users of native mobile applications are used to find icons for their most popular apps on their "homescreen". When providing a mobile learning application in form of a Web application, such an icon is typically missing. Yet, mobile browsers allow to add bookmarks (including an icon) for Web applications on the homescreen. This facilitates access and can help to remind users of exercising during daily smarthone usage. Adding the Web app to the homescreen can be explained during the hands-on training and made easier by JavaScript utilities such as *ATH*[2].

Sufficient content. When first using the application, students intensively explore the available features and content. In order

[2] http://cubiq.org/add-to-home-screen

to keep them engaged and motivated, a comprehensive set of exercises should be provided from the start.

Practical Usage

Directly related to classroom teaching. Mobile exercises should be easily comprehensible and feature a topical connection to learning units previously covered during the class-based teaching. In this way, they should continue and help to deepen and review respective units. This includes regular updates of packages and newly available exercises.

Peer support. During the trial, students helped each other in case of problems with the application or when questions concerning the tasks occured. This kind of peer support for both technical and content-related issues should be fostered from the beginning, for example by officially appointing interested technology-affine students as contact persons.

Accordance with exam schedule. In our study, we found that the evaluated application was mostly used as a preparation tool for an upcoming exam, less as a steady learning companion. We conclude that teachers should provide suitable exercises and make them accessible for the mobile application in tight accordance with the exam schedule.

Clear usage policies. If teachers integrate the mobile application into their class-based teaching and allow its usage during the lessons, allowed usage times as well as breaks need to be clearly communicated to the students.

LIMITATIONS

Planning and conducting a field study with students and teachers within the scope of traditional language teaching in a school is complex and subject to certain constraints. In the following, we summarize the limitations of our research.

The focus of our study was on the general requirements and acceptance of a modern gamified app for class-based teaching by the involved parties. We did not conduct research on the long-term usage or factors for sustainable engagement with such an application in the school context. Further, although we had a quick look at the number of correct answers in quizzes, etc., we did not investigate the effectiveness of the app and its impact on the overall learning effect. This was not the objective of the study and its data do not allow for any respective conclusions.

Our research results do not demand for generalizability. The surveys and the trial were conducted in Central Europe with a very high penetration of smartphones (including plans with Internet access), even among young teenagers. Obviously, other aspects (compare the mentioned requirement of "social fairness") need to be considered when employing a related application in a country with other technical and infrastructural prerequisites (cf. [17]). Further, our field trial focused on English (as a foreign language) teaching for 13/14-year-olds. We assume, its results cannot be simply transferred to students of different age or other school subjects.

CONCLUSION AND OUTLOOK

In this paper, we presented an extensive study on the requirements and the acceptance of a mobile gamified learning application for complementing traditional classroom teaching in English language. We ran several interviews and surveys to uncover the respective attitudes of students, teachers as well as parents. To study the usage of a modern learning app under real-world conditions, we created a fully functional research prototype with advanced features inspired by the survey results and state-of-the-art language learning apps. Using this tool, we conducted a field trial with 13/14-year-old students from three classes of a secondary school.

Our results showed that the participating students generally appreciated the introduction of a mobile gamified learning companion as complement to the traditional classroom teaching. Also parents were positive about the usage of mobile devices and a respective mobile application for language teaching. Yet, they required certain conditions such as clear usage rules and the availability of suitable devices for all students of a class. An unexpected result was the parents' overall interest and willingness to use a respective mobile app for studying a language together with their children.

In the field trial, we found that gamification elements such as rankings and challenges work for the students in the school setting. These features were perceived as motivating and fun. We did not observe any negative impact on the classroom community. The additional administrative efforts for the teachers should be minimized. Vocabulary lists and suitable grammar exercises should be provided by the respective publishers of school books. As an alternative approach, a respective platform might allow for creating and sharing exercises in a collaborative manner. For example, a teacher (maybe even together with students) could create exercises for a specific book chapter and make this unit publicly available for other teachers who then just need to activate or publish that unit for their students.

While this work focused on the involved parties' requirements and acceptance criteria for introducing and using a mobile learning app, we did not study long-term effects of such an app in the classroom context. Future work should include an extended field trial to investigate user behavior in the long-term, uncover specific usage patterns and find concepts to support the students' and teachers' continuous engagement.

As mentioned above, our study results do not demand for generalizability. Future research should explore mobile and gamified blended learning in the field for students of different age and the applicability of the presented app concepts for other school subjects, for example. Finally, we consider the further investigation of school-specific app features promising. For example, application concepts exploring the involvement of parents who are interested in learning together with their children should be studied. In addition, such a learning companion could be extended to a more general communication channel among students, teachers and parents.

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