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Christian Ludwig, University of Education Karlsruhe,
Germany

Corresponding author: christian.ludwig@ph-karlsruhe.de

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Christian Ludwig, University of Education Karlsruhe, Germany

Abstract

The fast and increasingly natural adoption of handheld devices such as smartphones and tablets into everyday life is a rapidly growing social phenomenon which is also believed to have vast potential for foreign language learning. The small-scale study presented in this article contributes to the discussion of whether handheld devices should be further integrated into or eliminated from the classroom by presenting part of the results of a small-scale study conducted in a German secondary English as a foreign language classroom. The study examined the impact of a mobile vocabulary learning app on secondary school students' vocabulary performance, also giving some indications about the students' development of foreign language learner autonomy. Although the results of the study showed an unexpectedly limited use of the app, they allow assumptions to be made about the reasons which prevented students from using the app more frequently which can influence future researchers' and practitioners' app choices. The first section of this article briefly outlines the theoretical framework of the study, particularly focussing on the potential of computer-assisted and mobile-assisted language learning for enhancing students' foreign language skills and learner autonomy. The ensuing section then provides some background on investigating students' foreign language vocabulary learning. This is followed by a presentation of the research design, including the main features of the app (Socrative) used in this study. The next section then critically discusses some of the major research results. The contribution concludes by summarising some of the outcomes of the study and outlining some gaps for further research.

Keywords: Foreign Language Learner Autonomy, Mobile Learning, Vocabulary Learning, Learning Apps

CALL/MALL and Foreign Language Learning

While Computer-Assisted Language Learning (CALL) has been around for over fifty years (Hubbard & Levy, 2016), the field only appears to have matured over the last decade alongside the accelerating change of (educational) technology. When it comes to using digital media in the foreign language classroom, there is now extensive theoretical work, suggesting that digital media can have positive influence on students' learning experiences and outcomes (Thomas & Reinders, 2010; Thomas, Reinders & Warschauer, 2013; Peeters & Ludwig, 2017). Moreover, it has been argued that digital tools play a vital role in developing learners' foreign language learner autonomy (Raya & Fernández; Smith & Craig, 2013). According to Reinders and Hubbard (2013, pp. 362-373), the potential advantages of digital media when

developing students' autonomy can be divided into organisational and pedagogical advantages. Pedagogical advantages include, among others, the ubiquitous access to information and materials which can be shared instantly by students. Pedagogical advantages refer to the processes of learning as well as the places of learning and the activities students engage in usually with others. For example, through using digital media, students have access authentic materials, taken from the internet, which can be used in a variety of new activities made possible through digital media. Furthermore, digital tools enable students to use places for learning other than the classroom, allowing them to learn anywhere and anytime (Burston, 2014, pp. 103-125). This idea of situated learning is closely related to the potential of using handheld devices for learning on the spot (cf. Kukulska-Hulme & Bull, 2009, pp.12-18). Mobile-assisted language learning (MALL), redefines the idea of traditional CALL by focussing on the use of handheld devices (Stockwell, 2013, p. 202; Terantino, 2016, p. 261). It can generally be defined as language learning which is enhanced through a mobile device which can be "[...] any device that is small, autonomous and unobtrusive enough to accompany us at all times and can be used for educational purposes" (Trifonova, Knapp, Ronchetti, & Gamper, 2004, p. 1). According to Traxler (2007, p. 8) one of the main advantages of MALL is that it exploits "[...] small amounts of time and space for learning". In order to be successful, the mobile device has to be an integral part of the student's life, not least to make learning spontaneous (cf. Stockwell, 2013, p. 204). Mobile assisted language learning predominantly takes place in out-of-class learning contexts, often connecting the classroom to the outside world (cf. Kukulska-Hulme, 2009, p. 262) and vice versa.

Since smartphones and other mobile devices are very popular among teenagers, it is not surprising apps have caused a "tremendous interest among educators" (Godwin-Jones, 2011, p. 2). However, there is still a scarcity of research when it comes to using digital media in general and handheld devices in particular in- and outside the classroom which supports the idea that technology really enhances the quality of teaching and learning and really improve students' results. As far as apps, applications for smartphones and similar mobile devices are concerned, students at least initially require support when using them for educational purposes (Lamy, 2013, p. 143). This poses challenges for the teacher as they can support students when using apps during class time but providing support is far more time-consuming and not always possible if the app is used outside of class.

Despite the assumed potential of MALL to increase the amount of learning time and reduce the psychological distance often associated with formal language learning, there are also critical voices regarding the use of mobile devices in language learning within- as well as

outside the classroom. First, smart device users may be exposed to the challenge of carrying out multiple tasks at once, e.g. communicating with someone in their surroundings while pursuing an activity on their smartphones (cf. Stockwell, 2013, p. 202). However, considering the fact that using mobile devices is natural to today's teenagers, this should not pose a major challenge to most students (cf. Baron, 2008; Bennett, Maton, & Kervin, 2008, pp. 775-786). Moreover, the limited screen size of mobile devices naturally limits the amount of information which can be presented simultaneously (Stockwell, 2013, p. 209). In addition, devices used in mobile-assisted language learning environments often have a limited storage capacity as well as processor speed, which also needs to be taken into consideration when reverting to such devices (cf. Stockwell, 2013, p. 209). Moreover, the fact that teenagers are used to using mobile devices regularly does not necessarily mean that they know how to exploit them for foreign language learning purposes, regardless the efficiency of the provided material (Stockwell, 2013, p. 210). Also, existing research indicates that students may consider mobile devices as unattractive or unsuitable for foreign language learning and are, therefore, hesitant or even unwilling to replace conventional language learning materials and methods (Stockwell, 2008, p. 209). Closely related to this, the design of mobile learning tasks and activities needs to consider the environment in which it they are completed (Stockwell, 2013, p. 211). For example, activities should be "short and succinct, with a very short start-up time as well as short-segmented sections" (Stockwell, 2013, p. 211). As far as the research on vocabulary learning with mobile devices with teenage students is concerned, Terantino (2016, p. 260) paints a rather gloomy picture. He states:

In recent years scholars have explored the use of mobile devices as potential sources for language learning and teaching. Mobile phones and tablets, especially, have been researched with a focus on effectively building vocabulary primarily among university-level students. Comparable research in other age groups has not been as widespread.

In a similar vein, Burston (2013) contends that roughly 90 of 575 published MALL studies (~15%) in the past 20 years were conducted outside higher education contexts, partly being due to the fact that researchers have easier access university students who are more likely to own a portable device (Smith, 2013). The ensuing section focusses on the theoretical background of students' vocabulary learning.

Investigating Students' Vocabulary Learning

Milton (2009) notes that “[o]ne of the advantages of examining vocabulary learning in a second language is that, superficially at least, it is a quality that appears to be countable or measurable” (p. 8). However, there is no ‘golden rule’ of measuring students’ vocabulary performance. This is partly due to the fact that there is no unanimous definition of what is a word. Words can be defined in many ways, for example, according to their orthography (Carter, 1992) which neglects any differences in meaning and issues of polysemy, homonymy, or grammatical function (cf. Takač, 2008, pp. 4-5). They can also be defined referring to their semantics. This is not all less problematic as, for example, some meanings consist of more than one word (e.g. bus driver), while other word groups, e.g. affixes, cannot stand on their own (cf. Takač, 2008, p. 5). Another way of counting words is by their word families (types). Word families reduce the number of new words to be learned and can potentially accelerate a student’s vocabulary learning once the grammatical rules are known.

As Milton (2009) posits:

Once you encounter and learn one form of a word, you can apply the rules for making plurals, or past tenses of verbs, or comparative and superlative adjectives, and you have a whole family of words at your disposal. (p. 10)

What is problematic is that one has to decide which words belong to the same family. For the purpose of the small-scale study discussed in the present article, we decided to use lemmata as the most suitable way to count the number of words students learned during the study. Lemmata include a headword, its most frequent inflections as well as reduced forms (cf. Milton, 2009, p. 10). A distinction between high- and low-frequency words (cf. Milton, 2009, p. 23) was also made for the purpose of this study. High frequency words cover approximately 80 percent of a text and form an important part of students’ vocabulary knowledge due to the large proportion of running words that they cover in spoken and written language (Nation, 2001, pp. 11-17). High-frequency words, for instance, can be function words or content words (cf. Nation 2001, pp. 11-15). Low-frequency words, on the other hand, only cover a small proportion of spoken and written language, since they occur very infrequently (cf. Nation 2001, p. 19). They, however, cover a wider range of word families than high-frequency words. As a result, the frequency of individual low-frequency words can differ greatly (cf. Milton, 2009, p. 23).

The focus of the study, however, was not on the students' overall vocabulary knowledge, but on the words students were able to learn during a period of two weeks, after which their new vocabulary knowledge was tested. Therefore, all words, no matter whether high- or low-frequency, were included. In other words, after the interval of two weeks, students were expected to know the form as well as meaning of all new words presented in the course materials.

In order to choose the most appropriate app for the study, it had to be decided what was meant by 'knowing a word'. According to Nation (2001, p. 35), three different types of 'knowing a word' can be distinguished:

- a) Knowing the form of a word: The form of a word can often be learned implicitly but requires repeated encounters with the form.
- b) Knowing the meaning of a word: This requires explicit learning.
- c) Knowing the function of a word: This includes knowledge of a word's grammatical functions as well as collocations.

To know a word involves a number of aspects, including its phonology, orthography, morphology, syntax and semantic (cf. Jiang, 2004, pp. 101-102; Takač, 2008, p. 10). Not all of the aforementioned aspects of knowing a word were considered of (equal) importance. For example, the spoken form of a word may have come up during the lesson but was not tested by the app. One dimension of word knowledge which was always tested during the study was the written form of a given word. Learning the written form of a word is strongly influenced by the writing systems known to the students, i.e. the L1 writing system as well as by a student's knowledge of the spoken form (cf. Milton, 2009, pp. 35-36; ISP Nation, 2001, p. 45). Two ways of improvising students' spelling were in the focus of the study, namely spaced repeated retrieval and monitoring and feedback. Other strategies such as relating the spoken and written form of a word were practiced during class.

The study

The present small-scale study was conducted at a medium-sized comprehensive school in the Karlsruhe region in Germany. The school actively encourages students to become autonomous learners and attempts to differentiate and individualise instruction as much as possible. The study was conducted in a year-nine class, consisting of 28 students, 18 of which

were boys. In order to secure the participants anonymity, each student was allocated a number between 1 and 28. According to the class teacher, the overall performance level of this particular class was below average, which was, for example, evident through the students' low participation during class time. Four of the students have a migrant background, resulting in a lower level of English due to a lack of previous instruction in the language in their home countries. Two of the students had to repeat the school year, one student was diagnosed with dyslexia, and one student was special needs.

The class' used *Red Line 5* by Cornelsen Publishing which is particularly designed for this age group and widely used in English classrooms across the country. Each unit covers a different topic and introduces the students to a certain number of new words. The textbook contains a topic-related, chronological vocabulary list as well as an alphabetic dictionary, which contains the words used in the book with reference to the section where the word was first encountered. The list consists of three columns. The first column shows the written English form of a word and its IPA transcription. As words are treated as lemmata inflected forms of a word are not individually treated, while derived forms and multi-word items are treated as individual words. Irregular inflections, while explicitly addressed, are not treated as individual words. The second column features the German translation of the related English form. One English form is often translated by more than one German word (f. ex.: extremely = *äußerst, höchst*) to cover the English form's meaning better (Haß, 2010, p. 165). In the third column, the English form of some words are presented in minimal context in form of sentence embedding, synonyms/antonyms or references to derived forms. Furthermore, some pages feature boxes that mainly contain additional information about topic related words.

The Socrative App was chosen for this study. While there are other apps available which are specifically designed for vocabulary learning, Socrative provides enough freedom to upload your own and not pre-built content, as well as track the learning of each individual student. Moreover, Socrative is easy to use which saved the participating students a lot of time when familiarising themselves with the app. Another reason for using this particular app was that it allows translation from L1 to L2 (referred to as 'entry exercise') and vice-versa (referred to as multiple-choice-exercises). The most frequently used vocabulary learning strategies are mechanical strategies such as memorisation and repetition (Takač, 2008, p. 59). Socrative uses word cards which allows students to quickly increase their vocabulary knowledge through focused and intentional learning (Nation, 2001, p. 303) through making connections between the word form and its meaning. When designing the word cards, it is important to keep them simple and not to include too much additional information such as its

etymology, collocations, or grammatical information. Socrative only presents the word in its written, not spoken form. The meaning of the word is presented through translations into the first language, not including definitions in the foreign language or images. Socrative is based on quizzes, containing three different question types: multiple choice, true or false, and questions which require a short answer. There are three ways of creating quizzes in Socrative. “**Teacher Paced Navigation**” can be used in class, to proceed in whichever way or speed the teacher wants to. “**Open Navigation**” offers the most freedom for the user, by allowing them to work on the exercises (one word = one exercise) in any order they like and changing answers in the process. Here, it is important to change the order of the word cards in order to avoid any primacy and recency effects (Baddeley, 1990, p. 52). However, it does not allow the user to get feedback on individual exercises. As such, open navigation would only give information about the percentage of words that were translated correctly, but neither state which words were incorrectly translated nor show the correct translation. This is why in this study the “**Instant Feedback**” method was used. While it does not allow the user to navigate freely between individual exercises, app-generated feedback is given individually on each exercise. Information about the percentage of correct answers of the entire unit is still given after finishing the unit. In order to prevent the students from just learning the order of questions and answers has been set on shuffle.

Each learning group was randomly assigned a room, with each room allowing access for up to 150 students. Additional features are, for example, the so-called ‘space race’, enabling students to compete with each other or ‘exit tickets’, which gives users feedback on their completed quizzes. Each room was controlled by the teacher. For example, if a student completed a quiz and it was not closed by the teacher, the student could repeat the quiz as many times as he or she liked. For the purpose of this study, eight rooms were created, with each room containing a set of words (unit) which had to be studied at a time. Four rooms contained ‘entry-exercises, while the other four were set-up as ‘multiple-choice-exercises’. In addition, each multiple-choice room not only required the students to translate the given word but also to spell it correctly in the foreign language which made these four units more challenging than the others four. This meant that even students who did not remember the word could still guess the correct translation which, presumably, also contributed to their vocabulary learning. The compulsory training units were added in a two-week interval, starting with when the new words were introduced in the lesson and until they were tested exactly two weeks later. Each interval consisted of four units of entry-and ‘multiple-choice-

exercises, each representing 25% of the new words introduced during class time, exactly in the order in which they were first mentioned during the lesson.

The app provides instant feedback, informing the user whether their choice was correct or not. Once student completes an entire unit, the student is informed of the score and the percentage of correct answers. Another important feature of Socrative is that all data is collected by the teacher app, which means that the teacher can monitor the correct answers of each student, including an overview of all incorrect answers the student typed in. Socrative does not collect data on how, when and for how long individual users made use of the app.

Discussion of Results

Pre-questionnaire

The purpose of the pre-questionnaire was mainly to gain insights into the students' availability of smartphones and internet access as well as their user behaviour. 26 out of 28 students participated in the pre-questionnaire, which was administered to students in person. (Figure 1), The results indicate that the majority of students are at least regular smartphone users (62%), with a small number of participants being less regular smartphone users and only one student not using their smartphone regularly. Moreover, the majority of students were able to access the internet with their smartphones either unrestrictedly using mobile internet (65%) or with wifi (31%).

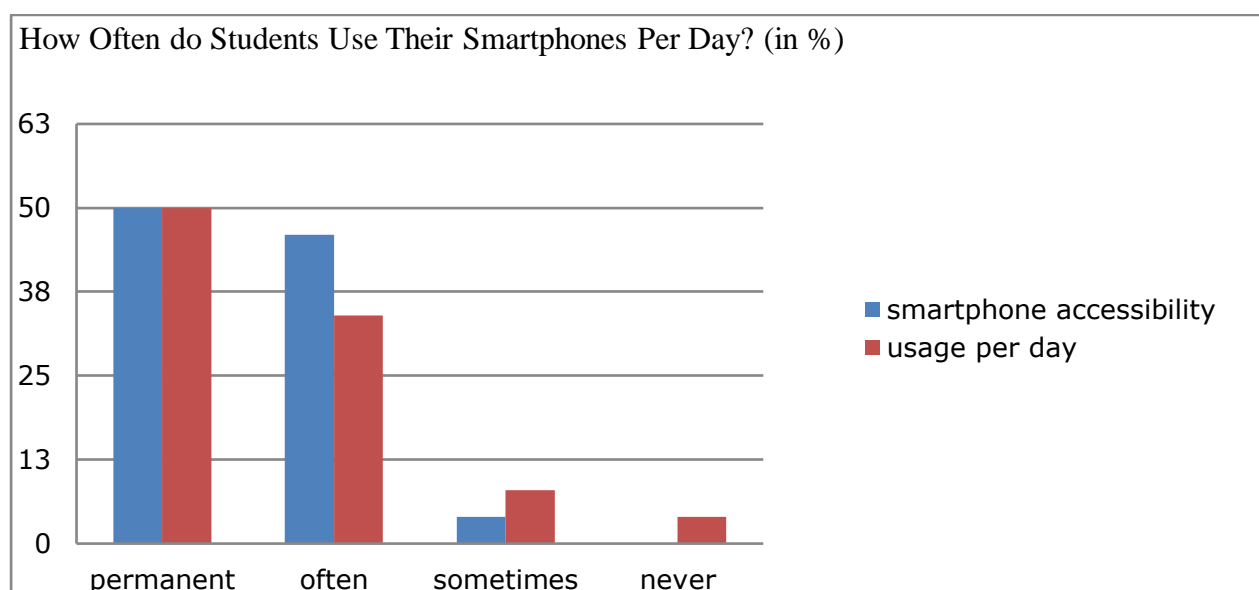


Figure 1. How Often do Students Access Their Smartphones?

The pre-questionnaire also inquired the students' general use of apps as well as the reasons for using applications such as WhatsApp. Not surprisingly, 92% of the students indicated that they mainly use their smartphone apps for communicating with their friends (92%) and for entertainment purposes (81%), for example using YouTube (33%). As far as the use of digital media for learning was concerned, 70% of the students answered that they had used digital media for study purposes before. Examples mentioned by the participants included using Google and Wikipedia. However, only about one third of the students had some kind of experience with educational media. Over 30% of this group reported that they had a generally positive attitude towards educational media.

As far as vocabulary learning is concerned, 15% of the students replied that they had used the vocabulary trainer app *Phase 6*. Last but not least, 75% of the students stated that they have a positive attitude towards the use of vocabulary learning apps, however, only 65% answered that they considered using a vocabulary learning app themselves. The overall results confirmed that using an app for vocabulary learning would not present a major challenge to the students as most of them had access to a smartphone with mobile/wifi internet access and were familiar with using apps in general, with some students also being used to reverting to apps for (vocabulary) learning purposes. Moreover, none of the participants showed a completely negative attitude towards mobile learning or digital tools. Before the beginning of the first interval, all students were given the opportunity to try out the app in-class together with the teacher. In order to provide a more realistic image of the students' real app use, the first entry from each student was not included in the data.

App data: Interval 1

The first two-week interval required students to learn 35 words, while the number was increased to 60 words during the second interval, starting with the multiple-choice units (MCU). Figure 2 shows that the number of students completing the units decreased after having completed the first unit, with only 18% of the participants completing all four multiple-choice units at least once.

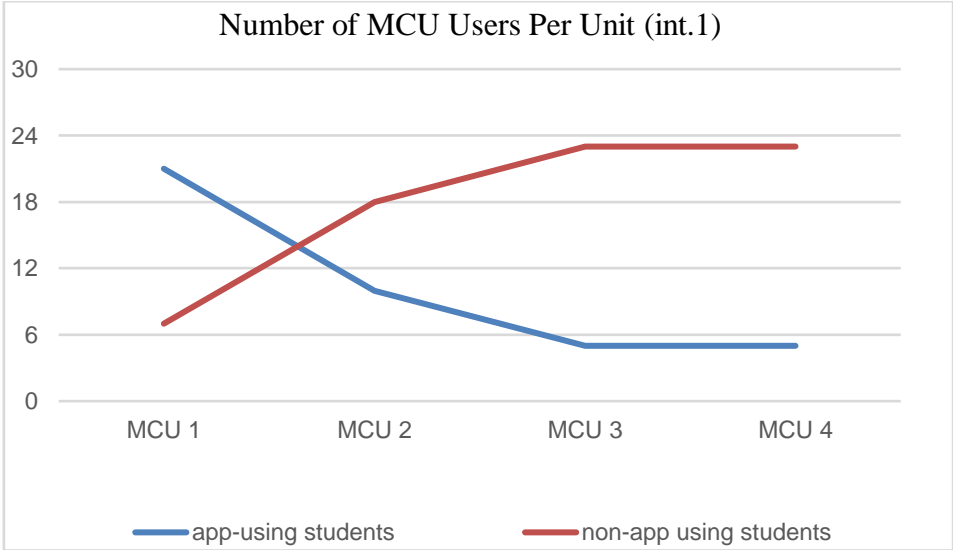


Figure 2. Number of MCU Users Per Unit (int.1)

The number of students completing the single-entry units (EU), however, was even smaller, with 57% not even completing a single unit and with only 7% completing all units. The number of users dropped rapidly from 43% to 14% between unit 1 and 2 (Figure 3).

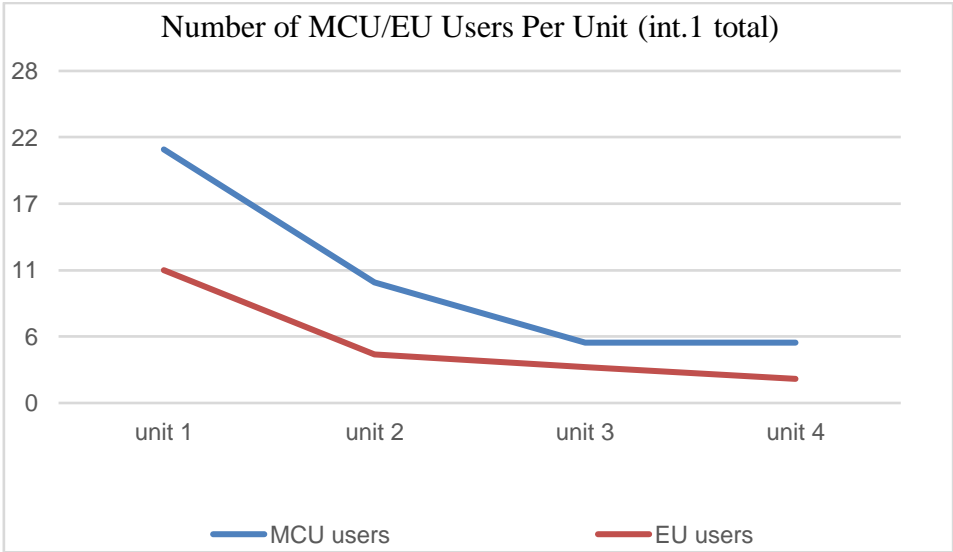


Figure 3. Number of MCU/EU Users Per Unit (int.1)

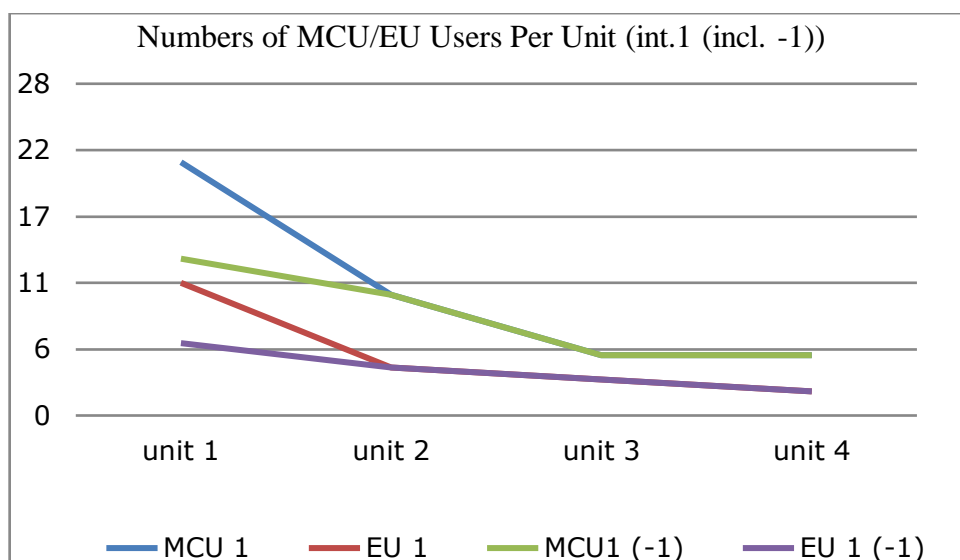


Figure 4. Number of MCU/EU Users Per Unit (int.1 (incl. -1))

Figure 4 shows that, while participation is still decreasing, it does not drop as drastically after the first unit. While interviewing the students individually was not possible, one can assume that the decrease in participation is related to the students' motivation, perhaps related to a perceived unattractiveness of the app. Moreover, it can clearly be seen that the number of students using the MCUs is significantly higher than the number of students using the EUs (\emptyset : 36% MCU vs 17,75%EU; 29,5% MCU (-1) vs 13,25% EU (-1)). Almost one out of four students did not use the app at all, with only two students (7%) completing all sets. 14% of the students did not participate in the test after the first interval. The app data shows that only 11% of these students had completed a minimum if half of the units. 46,5% of the students did participate, but worked on less than half the units. Therefore, feedback cannot be gained from these student's vocabulary test grades.

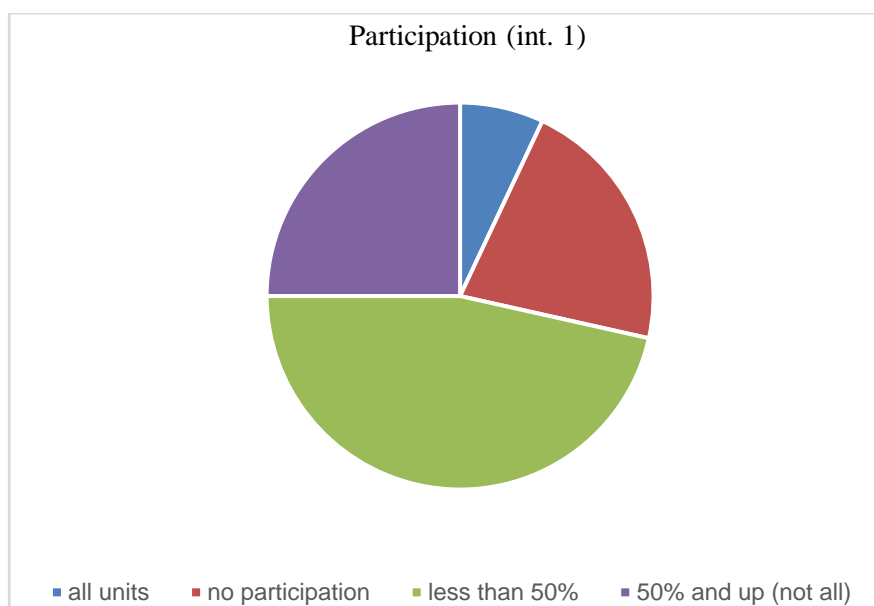


Figure 5. Participation (int.1)

Two individual students

In the following, Peter (a pseudonym) will serve to illustrate how individual words were processed. Peter was chosen because from all participants he had used the app most frequently. Figure 5 shows how individual words were answered in the second MCU. 33.3% of the words were initially answered correctly and did not pose a challenge to the student. Another 33.3% were initially answered incorrectly but were then answered correctly after the second round. 22.2% of the words caused more problems and were answered incorrectly twice. Since the app does not focus on a user's errors, the student had to repeat the entire unit in order to repeat the words he had difficulties with. While the repetition of already learned words may help the user to internalise them more deeply, it may turn out to be inconvenient to repeat through the entire unit in order to learn isolated word. Similar results can be observed for the rest of the group.

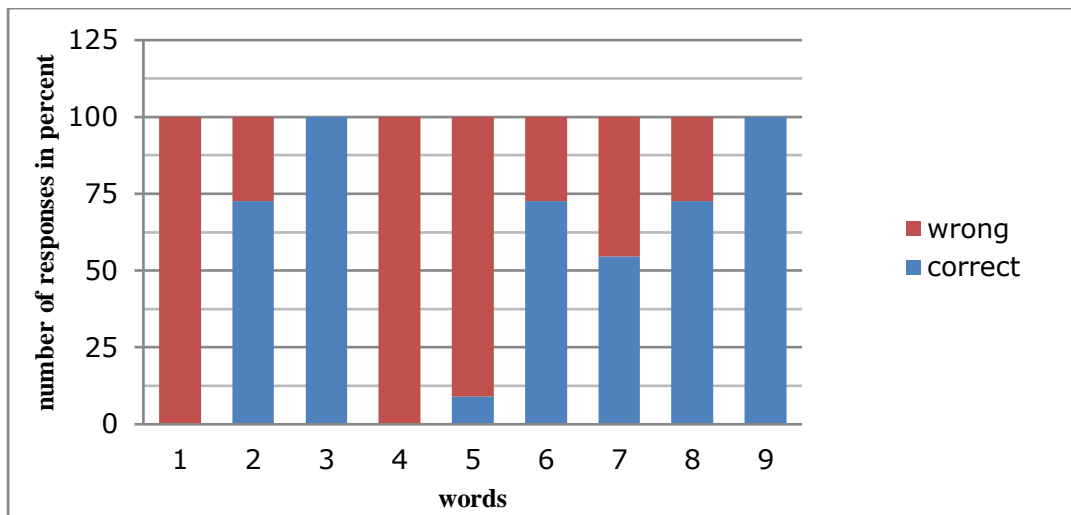


Figure 6. Peter/EU2/Answers (11 uses)

As can be seen in Figure 6, Peter’s answers differ noticeably from MCU ones. While for MCU2 each individual word was answered correctly at some point, this is not the case for EU2, even though EU2 was almost used twice as much as MCU2. 22.2% of the words were always answered correctly (11.1% less than in MCU2). Word number 5 (which the student evidently struggled with in MCU2) still proved to be difficult for the student but was ultimately answered correctly. Significant differences are noticeable within the records of the first and fourth word. Both words were answered correct in MCU2 in 66.7% of the cases. When answering EU2, however, Peter did not manage to submit the correct answer once. Taking a look at the words (vacancy (1) & environmental (4)) one can see that Peter had spelled the word incorrectly. Vacancy and environmental were both misspelled in 36% of cases (for example: vacancy: vancany/vacany; environmental: enviromental/enviromental). Therefore, it can be assumed that Peter had mainly problems with the written form of the words rather than with the form-meaning relationship. Due to the low participation in EUs hardly any comparison with other students’ results is possible. The exiting results, however, indicate similar problems. Furthermore, some words caused little to no problems to the students and were mastered quickly in both cases (MCUs & EUs). Only a very limited number of words appeared to be significantly more difficult in both MCUs and EUs. The majority of words were mastered after just a few attempts in the MCUs and with slightly more attempts in the EUs. Since the MCUs focussed solely on the form-meaning connection of the words and provided four possible answers, rapid progress was to be expected.

Student 10

Student 10, in the following referred to as Michael, worked on 50% of the first words from the first interval thus was different from the rest of the group. He only worked on the first two sets of units, making frequent use of them. In the first two sets of units, he displayed an average use of five and a half times for each MCU and six times for each EU. He managed to gain an average score of 94.5% correctness. The student made almost equal use of MCUs and EUs in each of the two sets of units (4/4; 7/8 (times responded)). His lowest MCU/EU score started at 33%/22% and continually increased. Thus rapid progress of the student's performance is visible, assuming that the words were not studied in advance.

Regardless the good results of the first set of units, the student did not study all of the first interval's words and scored a *befriedigend* (satisfactory) according to the German grading system in the vocabulary test. In the post-questionnaire, they indicated that they believed the app did not support their vocabulary learning process, while they later indicated to have found the app's contents helpful. The students stated the app functioned smoothly on their smartphone. Furthermore they liked the layout and concept of the app. They indicated that they experienced the MCUs as helpful for the earlier stages of studying, when not being very familiar with the words yet. In contrast, they experienced the EUs as helpful in the later stages of studying since the words had to be mastered in order to answer them correctly. While this student seemed to have used the app the way it was meant to and initially improved reasonably fast using the app, they eventually stopped using it. Since the student stated to have planned on using the app, but seldom having done so regardless of the good experience, it can only be presumed what might have kept that student from using the app. The only indication the student gave in the post-questionnaire was the demand to be able to skip exercises and have access to a word list as the students' course book provides, before starting to work on the units.

Post-Questionnaire and Recommendations

25 of the 28 students (89%) filled in the post-questionnaire. The data collected from frequent app users indicates that the app did have a positive impact on students' overall vocabulary performance. Moreover, students who did not use the app or worked on the EUs before going through the MCU's made significantly less progress than (frequent) MCUs users. However, positive 'in-app' results did not always correlate with the students' test results. It can be assumed that this is mainly the case because of the time between app use and actual test date. Moreover, the multiple-choice-exercises may have tempted the students to

guess the answers rather than remembering the correct translation of words. The students' answers in the pre- as well as post-questionnaires indicate that, in most cases, the app itself did not cause any technological problems which may have influenced the students' low app use. The only aspect that was mentioned was the fact that the app could not be used without internet.

According to the post-questionnaires' results, the majority of students initially planned to use the app but ultimately did not. What could be noticed was the drastic decrease of app sessions after a very short time. Regarding the MCUs, the majority of students (56%) stated that they had mixed experiences, while 28% said that they enjoyed them. The remaining students did not share their experiences. Furthermore, it was pointed out by approximately 25% that being able to guess the meaning of the words did not support their learning. Also, about 10% of the respondents said that the MCUs only provided the German meaning of the English form but not vice versa. Being asked about the experiences with the EUs, approximately one third of the students emphasised that they enjoyed working through them, especially after knowing the meaning of a word and being able to focus on its spelling. 40% reported mixed experiences.

The most frequently mentioned problem with the app in the post-questionnaires was the log-in process, although students only had to enter an eight-digit password. While this seems like a relatively low barrier, one has to keep in mind that most students are used to apps without log-in, such as WhatsApp. Moreover, a complete vocabulary list which could be consulted before, during, and after using the app, indicating that students still did not entirely trust the app or were not used to this way of vocabulary learning. Closely related to this, the students' answers indicated that introducing the vocabulary in class was not sufficient for students. Furthermore, the app was not perceived as a learning tool per se but rather as an additional tool for monitoring the progress of paper-based self-study. In a similar vein, some students openly excluded apps as a vocabulary learning tool. Last but not least, some students indicated that they felt distracted by incoming messages and push notifications which sometimes either interrupted or even aborted the use of the app especially during the first set of units. This is backed-up by the recorded app data regarding the number of incomplete units. All in all, 80% of the students stated that their vocabulary learning did not benefit from using the app and that the app learning would not influence their vocabulary test results.

Based on this, the following recommendations for using vocabulary apps can be deduced. First, if possible, (vocabulary) apps which can also be used offline should be given priority. Second, the results indicate that registration and log-in processes should be kept to a

minimum as they seem to have a negative influence on the students' overall perception of the app. Third, especially with students who are used to using digital tools for learning within as well as outside the classroom, vocabulary learning apps should rather be made use of as an additional learning resource. Closely related to this, apps that resemble the apps most frequently used among students and thus reflecting a real-life seem to work better with students. Last but not least, students should be actively involved in the process of setting-up the app and, if possible, choosing the vocabulary to be learned with the app.

Conclusions

The aim of this small-scale study was to investigate the potential of vocabulary learning apps for students in secondary education. In summary, it can be said that the study cannot provide reliable information about the impact of educational mobile apps on students' vocabulary performance. However, it does provide insights into important factors and potential difficulties that may arise when designing, implementing and utilising a mobile app for students' in the foreign language classroom.

Notes on the Contributor

Christian Ludwig is currently substitute professor for American Cultural and Literary Studies at the University of Education, Karlsruhe, where he is also the Head of the English Department and Director of the Language and Self-Access Centre. His teaching and research interests include enhancing learner autonomy in the EFL classroom as well as Computer-Assisted Language Learning.

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