education sciences

MDPI

Article

Impact of Mobile Learning on Students' Achievement Results

Blanka Klimova

Department of Applied Linguistics, Faculty of Informatics and Management, University of Hradec Králové, Rokitanského 62, 500 03 Hradec Králové, Czech Republic; blanka.klimova@uhk.cz

Received: 23 March 2019; Accepted: 24 April 2019; Published: 26 April 2019

Abstract: Today, mobile learning is a well-established methodology thanks to its countless benefits such as accessing learning content anytime and anywhere, adjusting the content to students' needs, and timely feedback. The purpose of this pilot study is to illustrate that foreign language learning supported by a personalized smartphone app can be effective in the enhancement of university students' performance by implementing smartphone app learning in a continuous assessment. The methodology is a case study analysis of students' needs, with statistical processing of the collected data. The results reveal that foreign language learning, particularly studying and revising English vocabulary and phrases via smartphones is effective in the enhancement of university students' performance. However, such learning must be designed around students' needs and continuously facilitated by a teacher. Only then can it contribute to positive learning outcomes. In addition, the results also confirm that mobile learning can serve as an appropriate complementary method to other forms of course delivery. Further research should extend the mobile app to the Apple platform and iOS.

Keywords: smartphones; mobile learning; English; needs analysis; students' performance; achievement

1. Introduction

Mobile learning (m-learning) currently is a well-established methodology. It has been in use for almost 20 years and its use offers an anytime and anywhere method of learning [1]. Nearly all university students in developed countries possess some kind of mobile device [2] and 50% of them possess more than one [2]. The most used mobile devices among young people appear to be smartphones. The largest group as far as the use and ownership is concerned is young adults between 18 years and 29 years [3]. This fact has been also confirmed by other research studies conducted among university students [4,5]. In fact, students of tertiary education are a focus group in the context of this study.

The rapid spread of mobile devices, specifically mobile phones, led to their use in education, which resulted in the development of a new field, so-called Mobile Assisted Language Learning (MALL) [6]. MALL is a subdivision of Computer Assisted Language Learning (CALL) [7], but MALL differs from CALL in the use of handheld devices which enable spontaneous access to information and interactivity across different contexts of use [8]. Oz [9] summarizes the key features of MALL, which involve the opportunity to study independent of time and place, in both formal and informal settings, portability of mobile devices, and a chance of collaboration between students as well as between students and their teachers. Nevertheless, the key attribute of any mobile learning is the ubiquitous nature of mobile devices.

Research on the use of mobile phones and mobile applications (apps) used in English language teaching indicates that the implementation of mobile apps contributes to the development of all four language skills (reading, listening, speaking, and writing). This includes their assessment, as well as

supporting migrant learners with rich resources and contextual recommendations on their phones, thanks to their personalized approaches [10]. Research reveals that mobile apps primarily affect retaining new words and phrases. This is particularly true for students in the institutions of higher learning. For instance, Wu [11,12] reports in his studies that these students using a mobile app can retain 89 words more than the learners who do not use such an app. He attributes it to the fact that students are exposed to a mixture of different media that are available through this app. The acquisition of new vocabulary via a mobile app was also researched by Rezaei et al. [13], who in their study claim that using the apps helped increase learning of vocabulary, confidence, class participation and that students had a positive tendency towards the use of multimedia in education. Moreover, Teodorescu [5] states that the use of mobile language apps can offer different content material adjusted to the student's level of the target language, evaluate his/her progress and provide feedback on it. The students using a mobile app also seem to be more stimulated to learn both in formal and informal settings [5,14,15], especially if timely feedback on students' activity is provided [16]. Furthermore, students also exhibit less anxiety [17].

There are also evident pitfalls of using smartphone apps in foreign language learning. The most common negative effects are a lack of attention and concentration [18], which might be also caused by mobile phone multi-tasking, switching between different activities on a mobile device or several devices. Mobile phone multitasking is widely considered to be a major source of distraction in academic performance [19]. Attention deficits and distractions during the process of learning may lead to memory problems such as encoding, storing and retrieving information, which is then manifested in students' inability to recall needed information at exams [20].

Although there are ample mobile apps for learning English on the market, they are not suitable for specific foreign English language classes; they do not simply meet specific students' needs at the moment. The content of mobile apps must be adjusted to meet students' immediate needs as far as English learning is concerned [21]. For example, students who study Management of Tourism want to practice vocabulary connected to this field of study and to their level of English, which should reflect their knowledge of English at the start of the course. Students whose English is at B2 level (upper-intermediate level of English) do not want to study basic vocabulary or phrases. Only if students' needs are met, can the mobile apps serve as appropriate and reliable tools for learning. In fact, developers of such apps try to meet students' needs and they try to tailor the content and technical specifications to meet these needs.

Andersen [22] claims that the feedback function in these mobile apps is limited. Although some evidence exists based on case studies of the effectiveness of mobile phones and their apps on the enhancement of foreign language learning [10,23], there is still a need for further research in this area. Therefore, the author of this study attempts to show how smartphones can be useful in university students' performance if the teaching and learning processes are purposefully designed and tailored-made. The purpose of this pilot study is to illustrate that foreign language learning supported by a personalized smartphone app can be effective in the enhancement of university students' performance by implementing smartphone app learning in a formative assessment.

The research question of this study is as follows:

Is the tailored-made mobile app for learning new English words and phrases effective in the enhancement of university learners' performance?

The corresponding hypothesis is as follows:

H: Students who use the mobile app in their learning have significantly higher learning outcomes than students who do not use this app.

2. Materials and Methods

2.1. Participants

Altogether 33 students participated in this case study. In the winter term of 2017, they all attended the English language course. They were all full-time students of Management of Tourism in their third year of study at the Faculty of Informatics and Management in Hradec Králové, Czech Republic. Their level of English according to Common European Reference Framework for languages (CERF) [24] was B2 level, apart from one student whose level was B1 (intermediate level of English). During the semester, however, two students left the course, and thus, only 31 learners completed it. The course lasted from 26 September till 12 December 2017 and classes were held regularly once a week for 90 min. Out of 31 students, 19 students used a smartphone with a special mobile app tailored to their needs as a supporting tool outside the face-to-face classes during the whole semester, i.e., for 11 weeks. Twelve students served as a control group.

2.2. Study Design

The first method used in this study was a needs analysis since the proposed mobile app should satisfy and enhance both students' learning and study achievements. The needs analysis was based on the SWOT (strengths, weaknesses, opportunities and threats) self-evaluation and was conducted during the first introductory lesson.

Secondly, on the basis of the data from the needs analysis, a mobile app was designed and gradually developed. It is called Angličtina (English) TODAY and uses a server part, a web application and a mobile application. The web app serves the teacher to implement the content material in it and the mobile app serves students to practice new words and phrases. This app is only intended now for the Android operating system, accessible at no costs at the Google Play store. The reason for choosing this operating system was a larger percentage of students using it. The app itself then enables use of its statistics since it can collect all user data and distribute it to the server for further research and assessment by the teacher. Thus, the teacher can see which words or phrases are difficult for students to remember and they can then practice them with students during the face-to-face classes. At the same time, the mobile app provides immediate feedback to students on their performance in each designed lesson. They can see what the correct form of the word or phrase is. Since the semester is approximately 11 weeks, altogether there were 10 lessons divided into two sections, one on learning and revising individual words and one on learning and revising new phrases. Both words and phrases are tested as translations from students' native language into the target language, in this case into English. The translation of the words and phrases also has pronunciation support. Overall the key benefits of this newly developed app consist in its user-friendly control, simplicity, and the content adjusted to students' needs.

Thirdly, a method of continuous assessment conducted throughout the whole course was used when using the mobile app. Finally, methods of analysis and evaluation of the results of students' achievement tests (taken by all 31 students), including a statistical analysis, were used, as well as a comparison of the findings with the similar research studies was performed. The pass mark for the final achievement test was 50%, i.e., 30 points. After the final test, the students who used the app were also asked to fill in a short evaluation questionnaire concerning the use of the mobile app and their study behavior. This questionnaire was based on the study by Lameris et al. [25].

3. Results

The findings of the needs analysis revealed that students' biggest weakness was learning and retention of English vocabulary. This need was also confirmed by other research studies, e.g., [11–13,26]. In addition, students wanted to learn and practice the words from their field of study, i.e., Management of Tourism.

Therefore, the newly developed smartphone app (Figure 1) was targeted at and tailored to the development and revision of novel English vocabulary. There were ten parallel lessons of vocabulary and phrases. The content of the lessons was physically completed with words and phrases by the teacher, and the students had to translate the word or the phrase from their native language into English. Each lesson was done as a test and consisted on average of 15 new words and 10 new phrases. The selected words and phrases were those discussed in the face-to-face classes and focused on their field of study, i.e., tourism, the topics generated by the needs analysis at the beginning of the course.

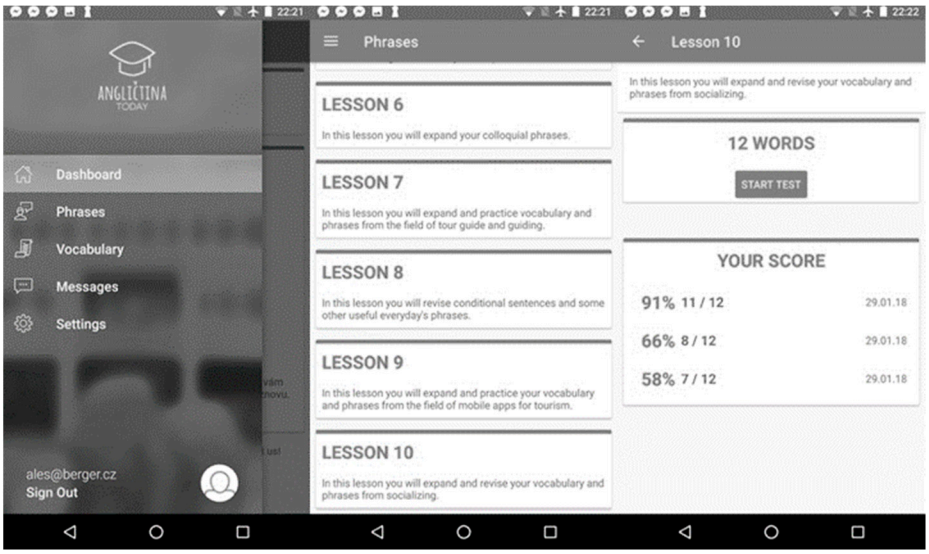

Figure 1. Smartphone app.

The teacher encouraged students to use the mobile app and practice new words and phrases discussed in class through posting notifications twice a week. There were in total 16 notifications (days of the semester: 27.9., 2.10., 4.10., 15.10., 18.10., 26.10., 30.10., 3.11., 6.11., 17.11., 23.11., 27.11., 30.11., 4.12., 7.12., 11.12.), which attempted to encourage students to learn new words and revise these new words and phrases regularly. However, their study was the most intense especially two days before the final test when the revision of new words and phrases was 3–4 times higher than usual. The students in the control group were only encouraged to learn the new words and phrases during the contact classes, which, of course meant that they had fewer opportunities to practice the target language than the students in the experimental group.

The results of the final achievement tests revealed that most of the students who had not used the app for practicing after regular classes had done badly although they had an opportunity to study these words and phrases discussed and written down in the face-to-face classes on their own after the classes. However, they were not sent the notifications to remind them to study them, and thus they had fewer opportunities of exposure to the target language.

The results were also confirmed by the statistical analysis. The results of the two groups are illustrated in Figure 2 below. These demonstrate that the students of the experimental group (1) achieved higher results than the students in the control group (0). The students who were using the app achieved 43.9 points on average and the students in the control group achieved 31.8 points on average in the final achievement test.

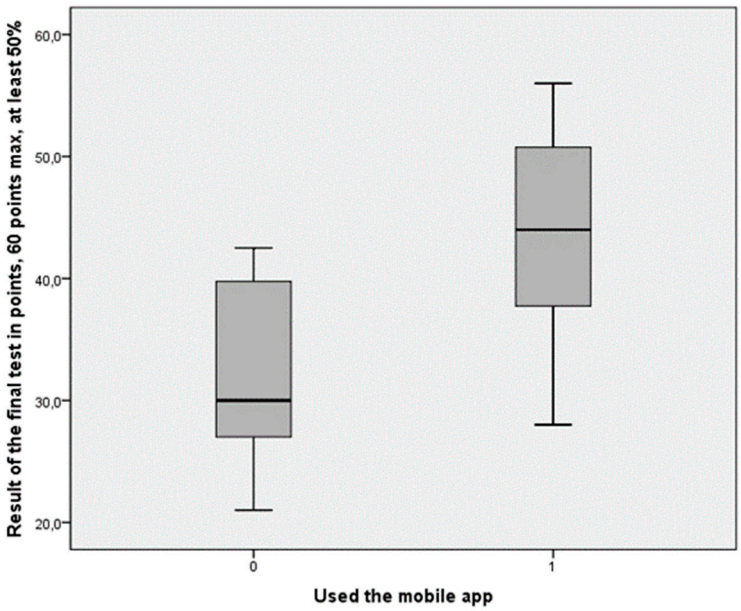

Figure 2. A box diagram of students' results.

This observation was further confirmed by the calculation. Due to the small ranges of the two sets in the pilot study, it was not possible to use the parametric *t*-test to compare the mean values obtained from the tests. Thus, a non-parametric Mann-Whitney U test with a *p*-value estimated from approximation by normal distribution and continuity correction was used. According to the result of this test, the hypothesis H can be assumed at the significance level of 0.01, i.e., the students who used the mobile app in their learning had significantly higher learning outcomes than the students who did not use this app.

The results of the evaluation questionnaire concerning the impact of the use of the mobile app on students' study behavior revealed that students felt very positive about it (Figure 3).

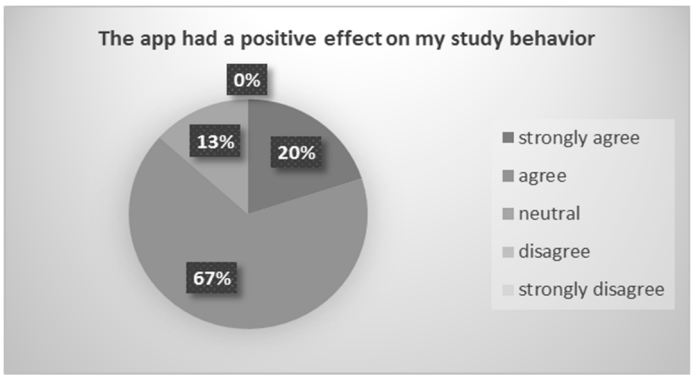

Figure 3. Impact of the app on students' behavior.

In addition, 66% strongly agreed and 33% agreed that it had been great support in their preparation for the final test (Figure 4).

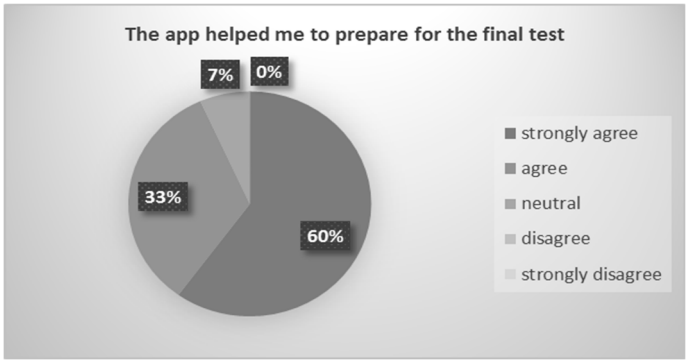

Figure 4. Impact of the app on students' preparation for the final test.

Eighty percent of the respondents would also implement such a mobile app in other courses taught at the faculty (Figure 5).

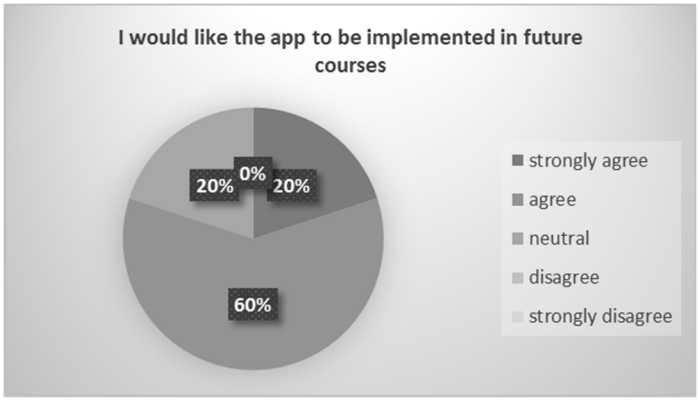

Figure 5. Students' opinion on the use of the app in future courses.

4. Discussion

The results of this study indicate that foreign language learning via smartphones, particularly studying and revising English vocabulary, is effective in the enhancement of university students' performance. This was evidenced by the statistical analysis, which confirmed the set hypothesis that the students who used mobile apps in their studies had significantly higher learning outcomes than the students who did not use this app. Such results were also found in other research studies on learning English vocabulary [11–14,17,27]. This is true thanks to a well-planned pedagogical process, because the needs analysis had to be done first in order to make the whole foreign language learning motivating and purposeful.

Secondly, on the basis of the needs analysis, relevant pedagogical methods (e.g., formal and informal learning), including methodological aids, in this case the personalized mobile app, were selected. This is in compliance with the findings of Teodorescu's [5] study on business English, which state that teaching and learning strategies have to be adapted to learners' needs in order to make students' learning more effective.

Thirdly, the teacher continuously encouraged students in the experimental group through the posted notifications, to use the mobile app and thus learn and practice new English vocabulary outside the face-to-face classes. Nevertheless, students had to realize that they must be active in their learning to consequently succeed [28]. Again, it was the teacher as a facilitator who at the beginning of each face-to-face class randomly checked some of the English vocabulary from the mobile app. This also provided those students who did not work with the app some feedback on their study. For example, Celik and Yavuz [29] claim that a supervised and monitored implementation of smartphones can enhance the efficacy and excellence of any foreign language learning.

Overall, students felt that the mobile app had a positive impact on their study behavior and would welcome such apps in their other courses offered by the faculty.

The limitation of this case study consists in the small subject sample, which is connected with piloting this tailored-made mobile app. In addition, the students who did not possess the Android platform in their smartphones were disadvantaged and were not able to use the app, which meant that they did not have so many opportunities of exposure to the target language. That means the extra practice time may have played a role in achieving better scores by the students in the experimental group. Therefore, further research is needed to validate the findings of this investigation. Furthermore, both groups should get the same amount of exposure or practice time to ensure the reliability and validity of research findings. In addition, there were also a few cases when the app did not work properly.

5. Conclusions

The results of this article reveal that the learning materials and tools, such as the described mobile app, designed based on students' needs and continuously facilitated by a teacher, are effective in the enhancement of students' performance and contribute to positive learning outcomes. In addition, the results also confirm that mobile learning can serve as an appropriate complementary method to other forms of course delivery thanks to its opportunities of frequent exposure to the target language. However, students were also encouraged to use the mobile app for the meaningful content and immediate feedback they received.

Future research should continue in order to obtain more subject samples and thus, more conclusive results, as well as extending the mobile app to the Apple platform and iOS, which could enable other students who did not have the Android platform to use the mobile app as well.

Funding: This research received no external funding.

Acknowledgments: This paper was supported by the research project SPEV 2104/2019, run at the Faculty of Informatics and Management, University of Hradec Kralove, Czech Republic. The author thanks Aleš Berger for his help with data collection.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Klimova, B.; Poulova, P. Mobile learning in higher education. *Adv. Sci. Lett.* **2016**, *22*, 1111–1114. [CrossRef]
2. Cheung, S.K.S. A case study on the students' attitude and acceptance of mobile learning. In *CCIS 2014*; Springer: Berlin/Heidelberg, Germany, 2015; pp. 45–54.
3. Smith, A. Record Shares of Americans Now Own Smartphones, Have Home Broadband. Available online: http://www.pewresearch.org/fact-tank/2017/01/12/evolution-of-technology/ (accessed on 12 December 2018).
4. Klimova, B.; Poulova, P. Mobile learning and its potential for engineering education. In Proceedings of the 2015 IEEE Global Engineering Education Conference (EDUCON 2015), Tallinn, Estonia, 18–20 March 2015; pp. 47–51.
5. Teodorescu, A. Mobile learning and its impact on business English learning. *Procedia Soc. Behav. Sci.* **2015**, *180*, 1535–1540. [CrossRef]
6. Chinnery, G. Going to the MALL: Mobile assisted language learning. *Lang. Learn. Technol.* **2006**, *10*, 9–16.
7. Yang, J. Mobile assisted language learning: Review of the recent applications of emerging mobile technologies. *Engl. Lang. Teach.* **2013**, *6*, 19–25. [CrossRef]
8. Kukulska-Hulme, A.; Shield, L. An overview of mobile assisted language learning: From content delivery to supported collaboration and interaction. *ReCALL* **2008**, *20*, 271–289. [CrossRef]
9. Oz, H. Prospective English teachers' ownership and usage of mobile device as m-learning tools. *Procedia Soc. Behav. Sci.* **2013**, *141*, 1031–1041. [CrossRef]
10. Kukulska-Hulme, A. *Personalization of Language Learning through Mobile Technologies*; Cambridge University Press: Cambridge, UK, 2016.

11. Wu, Q. Designing a smartphone app to teach English (L2) vocabulary. *Comput. Educ.* **2015**, *85*, 170–179. [CrossRef]
12. Wu, Q. Learning ESL vocabulary with smartphones. *Procedia Soc. Behav. Sci.* **2014**, *143*, 302–307. [CrossRef]
13. Rezaei, A.; Mai, N.; Pesaranghader, A. The Effect of Mobile Applications on English Vocabulary Acquisition. Available online: https://www.researchgate.net/publication/261246911 (accessed on 12 December 2018).
14. Balula, A.; Marques, F.; Martins, C. Bet on top hat—Challenges to improve language proficiency. In Proceedings of the EDULEARN15 Conference, Barcelona, Spain, 6–8 July 2015; pp. 2627–2633.
15. Tayan, B.M. Students and teachers' perceptions into the viability of mobile technology implementation to support language learning for first year business students in a Middle Eastern University. *Int. J. Educ. Lit. Stud.* **2017**, *5*, 74–83. [CrossRef]
16. Kukulska-Hulme, A.; Viberg, O. Mobile collaborative language learning: State of the art. *Br. J. Educ. Technol.* **2017**, *49*, 207–218. [CrossRef]
17. Luo, B.R.; Lin, Y.L.; Chen, N.S.; Fang, W.C. Using smartphone to facilitate English communication and willingness to communicate in a communicate language teaching classroom. In Proceedings of the 15th International conference on Advanced Learning Technologies, Hualien, Taiwan, 6–9 July 2015.
18. Deniza, O.G.; Kaplana, S.; Selc, M.B.; Terzic, M.; Altuna, G.; Yurta, K.K.; Aslan, K.; Davis, D. Effects of short and long-term electromagnetic fields exposure on the human hippocampus. *J. Microscopy Ultrastruct.* **2017**, *5*, 191–197. [CrossRef] [PubMed]
19. Chen, Q.; Zan, Y. Does multitasking with mobile phones affect learning? A review. *Comput. Hum. Behav.* **2016**, *54*, 34–42. [CrossRef]
20. Thorne, G. What Are Some Problems Students Have with Memory? Available online: http://www.cdl.org/articles/what-are-some-problems-students-have-with-memory/ (accessed on 12 December 2018).
21. Zou, B.; Li, J. Exploring mobile apps for English language teaching and learning. In Proceedings of the 2015 EUROCALL Conference, Padova, Italy, 26–29 August 2015.
22. Andersen, I. Mobile Apps for Learning English. Available online: https://skemman.is/bitstream/1946/14524/1/English_BA_thesis_FINAL_.pdf (accessed on 12 December 2018).
23. Klimova, B. Mobile phones and/or smartphones and their apps for teaching English as a foreign language. *Educ. Inf. Technol.* **2017**, *23*, 1091–1099. [CrossRef]
24. CERF. Available online: https://www.coe.int/en/web/common-european-framework-reference-languages (accessed on 12 December 2018).
25. Lameris, A.L.; Hoenderop, J.G.J.; Bindels, R.J.M.; Eijsvogels, T.M.H. The impact of formative testing on study behaviour and study performance of (bio)medical students: A smartphone application intervention study. *BMC Med. Educ.* **2015**, *15*, 72. [CrossRef] [PubMed]
26. Lee, P. Are mobile device more useful than conventional means as tools for learning vocabulary? In Proceedings of the 8th International Symposium on Embedded Multicore/Mangcore SoCs, Aizu-Wakamatsu, Japan, 23–25 September 2014.
27. Yaman, I.; Senel, M.; Yesilel, D.B.A. Exploring the extent to which ELT students utilize smartphones for language learning purposes. *S. Afr. J. Educ.* **2015**, *35*, 9. [CrossRef]
28. Demouy, V.; Jones, A.; Kan, Q.; Kukulska-Hulme, A.; Eardley, A. Why and how do distance learners use mobile devices for language learning? *EuroCALL Rev.* **2016**, *24*, 10–24. [CrossRef]
29. Celik, O.; Yavuz, F. The effect of using mobile applications on literal and contextual vocabulary instruction. *IJLT* **2018**, *0*, 126–136. [CrossRef]