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Review article

<https://doi.org/10.31784/zvr.11.1.12>

Received: 29. 11. 2022.

Accepted: 2. 2. 2023.

USING MOBILE APPLICATIONS FOR LANGUAGE LEARNING AS PART OF LANGUAGE CLASSES: A LITERATURE REVIEW OF RECENT PRACTICES

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ABSTRACT

Over the last decade, language learning with digital technology in general, and mobile technology in particular, has received significant attention in both research and practice. This is mostly attributed to the learning-enabling aspects of mobile-assisted language learning (MALL) on the one hand, and the rapid development of hardware (mobile devices) and software (mobile applications) on the other. MALL offers the opportunity to use mobile devices for learning not only within the confines of the language classroom, but also outside it, making it particularly relevant for the implementation of distance learning. This paper examines latest practices concerning the implementation of MALL into the teaching and learning process by reviewing relevant literature from the field, with particular focus on designated mobile applications for language learning. The literature review, which identified 17 relevant publications over the period of roughly two and a half years (between January 2020 and April 2022), codes educational interventions described therein in terms of the context of language learning and the effects of introducing mobile technology into language classes. The results of the review reveal significant diversity in mobile applications employed for language learning, pedagogical approaches that underlie educational interventions, teacher roles, and positive effects for language learners, which may prove useful to language practitioners when organising language classes that include mobile technology.

Key words: language learning software, literature review, mobile applications, mobile assisted language learning, mobile learning effects

1. INTRODUCTION

The increased use of digital technology in performing everyday tasks is noticeable in all areas of human life. Using digital technology to perform such tasks has its affordances, the main ones among them possibly being time efficiency and convenience for the user, and efficacy in achieving the task at hand. Therefore, it is not surprising that digital technology has found its applications

in more formal contexts, such as education. The field of language teaching and learning is no exception when it comes to applying digital media, and exhibits a rather long-standing tradition of employing it towards its own purposes, both in and outside the language classroom, which is a process whose beginnings may be traced back to the 1960s (Vawter, Martens, 2019).

However, introducing digital technology to achieve language learning outcomes is a non-trivial task which necessitates careful planning from the teacher in order to maximize the potentials of the technology, as technology on its own is not enough to achieve success in learning (e.g., Li, Lan, 2021). Bateson and Daniels (2012) point out that there are a number of variables to be taken into consideration when employing technology in language learning, including accessibility to learners and teachers, ease of use, and expertise of both teachers and learners regarding a given technology. Even though teachers report a wide usage of digital technology in their teaching practice, a large portion of it remains at a superficial level (if the overall potentials and affordances of technology are considered), as technology is employed primarily to deliver learning materials or engage teachers in direct or indirect communication with the students (Thomas et al., 2013). The question thus remains how teachers incorporate digital technology into the language teaching and learning process, and whether they harness its full power.

One particular type of digital technology that has been receiving increased attention in research and practice over the last decade or so is mobile-assisted language learning (MALL). This popularity is mostly attributed to the enabling aspects of the technology used to implement it (Stockwell, 2013), including the opportunities for self-directed study (García Botero et al., 2019; Rosell-Aguilar, 2018), accessibility and out-of-class usage (Bateson, Daniels, 2012; Persson, Nouri, 2018), increased multimedia and communication capabilities allowing community creation and collaboration (Bateson, Daniels, 2012), and the inherent design features of both mobile devices and appropriate software (Booton et al., 2021). As a concept, MALL may be considered as closely related to what Bax (2003), almost two decades ago, termed integrated computer assisted language learning (CALL) – a context in which language-learning technology is seamlessly integrated into people's everyday lives. His notion further entails that language learning may take place anywhere and at any time using digital technology, even without the direct assistance of a language teacher (Stockwell, 2013), which MALL supports through a variety of mobile devices and appropriate language learning software (mobile applications).

This paper takes a closer look at the recent MALL practice, the modalities of its incorporation into the language teaching and learning process, and the results of such practices over the period of almost two and a half years (beginning of 2020 until April 2022). More specifically, the goal of the paper is to review current practices reported in the relevant literature (peer-reviewed, CALL- and MALL-related journals, and conference papers) on the topic of introducing mobile applications for language learning into the teaching-learning paradigm, and to summarize their effects on the learner. Two research questions (with appropriate granulation) are therefore formulated:

- RQ1: How are mobile applications for language learning implemented in the language teaching and learning practice, both in and outside teacher-mediated contexts?

- RQ1a: What type of language teaching pedagogy do mobile applications for language learning employ?
- RQ1b: What language skills do mobile applications for language learning target, and in what way?
- RQ1c: What are the roles of teachers in implementing mobile applications for language learning into the educational process?
- RQ2: What effects of using mobile applications for language learning in and outside teacher-mediated contexts are reported in the relevant literature?

The rest of the paper is organized as follows. Section 2 offers relevant background pertaining to MALL and an overview of related work. Section 3 explains the details of the review methodology employed in this work. Section 4 presents the results obtained from the literature review and discusses them and their implications for language teaching and learning practice. Section 5 concludes the work and offers guidelines for future research and practice.

2. BACKGROUND AND RELATED WORK

2.1 Mobile-assisted language learning and modalities of implementation

Even though an initial definition of MALL was offered in the introductory part of this work, the overview of the usage of MALL in practical contexts requires a more detailed consideration of the notion.

Burston (2014:345) aptly noticed that the definitions of MALL found in the relevant literature vary depending on the particular focus of their authors, namely those who stress the ‘mobility of the learner’ and those who put more emphasis on the technology itself and the use of portable devices. Those belonging to the former group see any technology that allows flexible (place- and time-wise) access to language learning tools as signifying mobile-learning, including e.g. web-based applications which may be accessed from both stationary and mobile devices over the web, but at the learner’s own pace and from different physical locations. Those belonging to the latter group, however, further take into consideration that the hardware used for learning is also mobile, allowing on-the-go language learning closer to Bax’s (2003) notion of integrated CALL. This paper takes side with the latter and, similarly to authors such as Kukulska-Hulme (2013) or Kacetl and Klímová (2019), define MALL as a form of language learning which is supported by mobile devices (i.e. hardware) in a meaningful way so as to enhance language learning, and which occurs in any place and at any time convenient to the learner. Such a definition is considered to stress the importance of informal contexts for language learning (outside the classroom, independent, and self-directed learning environments), which, however, may be used by the teacher to complement classroom-bound learning activities.

The introduction of new technologies such as MALL into the language teaching and learning process calls for new and diverse environments in which learning will take place. Environment, in this instance, is a broad term covering many elements, including the technology, the language syllabus, the stakeholders, as well as general and language skills necessary to implement MALL in

practice. In the case of MALL, such new environments are brought on by the affordances of the mobile technology, the most important among them being the possibility to learn outside the teacher-supervised environment at a time of the student's convenience. Stockwell and Tanaka-Ellis (2012) identify four environments in which CALL can take place. Three among those, namely blended environments, distance environments, and virtual environments, may also be suitable in MALL, given the already discussed affordances.

The term blended learning environments is used to describe a range of different contexts in which (mobile) technology is combined with classroom activities to achieve the overall goals of the language curriculum (Lamy, 2013). The degree to which technology is employed, i.e. the ratio of technology-assisted to face-to-face activities, may differ depending on the context and the needs of the learners: at times it plays the principal role, while at others a secondary or tangential role (Stockwell, Tanaka-Ellis, 2012).

In distance learning environments, most of the learning takes place without the immediate presence and guidance of the language teacher, as there is a physical distance between the language teacher and learners (Lamy, 2013). Thus, communication between them is enabled by telecommunication systems and the use of different digital media (Simonson et al., 2015). Moreover, in some cases the software used to implement distance language learning (e.g., a smartphone or web application) may take over some of the usual responsibilities of the teacher and simulate the teacher's behaviour (Slavuj et al., 2017). The responsibilities include, but are not limited to, the following: determining the dynamics of instruction, enabling an interactive environment that promotes productive skills, monitoring the progress of learners, and offering feedback for language activities (Lamy, 2013; Slavuj et al., 2017).

Virtual environments are online environments in which learners, usually represented by avatars, engage in direct social interactions using their language and extra-linguistic skills to achieve particular tasks (Sadler, Dooly, 2013). Massive multiplayer online roleplay games, such as World of Warcraft, or multi-user virtual environments, such as Second Life, are typical examples of this type of environment.

2.2 Mobile applications for language learning

Mobile applications or mobile apps for language learning are those pieces of software that may be installed on or directly accessed over a mobile device, and whose content and purpose are adapted to a MALL environment. Their goal is to provide language-related, and often context-dependant (Burston, 2014) education services such as appropriate content delivery, (automated) feedback, or even guidance for the learner, using the multimedia capabilities (e.g., text, video, audio, or access to the web) of the technology (Bateson, Daniels, 2012).

Given their source and developmental purpose, mobile language learning apps may be roughly divided into two distinct categories. On the one hand, there are commercial applications developed by designated software companies and distributed among learners with the goal of making profit. Commercial apps are easily downloaded using app stores already available through smartphones and other devices, which makes them accessible to a world-wide audience, and

they are maintained (improved, extended) by their developers. The principal examples include Duolingo, Busuu, Babbel, Memrise, and Rosetta Stone. On the other hand, there are applications developed by researchers and practitioners in the field of language education that are created for a specific (usually research-oriented) purpose. These, however, may not be so widely accessible to larger audiences as their use may be restricted to a single educational institution, or even a single course within the curriculum. The goal of such applications is other than profit.

Some of the main concerns regarding the above distinction include whether and how commercial apps enhance educational learning experiences and outcomes (e.g., Finardi et al., 2016; Li, Lan, 2021; Loewen et al., 2019), and whether language learning approaches found in such apps are in line with the current language learning pedagogy (e.g., Li, Lan, 2021; Lotherington, 2018, Vawter, Martens, 2019). In this paper, both commercial and non-commercial applications are taken into consideration as long as they are implemented as part of a language syllabus. Following the findings presented in relevant literature, it is considered that both may offer apt opportunities to enrich the language learning classroom, if properly implemented.

2.3 Related work

There is a significant number of scientific sources that review the use of software in the context of language learning (in general), but only a handful of them specifically examine mobile applications. They differ in their approaches, scope, source selection criteria, database/journal selection, and depth of analysis. This subsection provides an overview of selected literature reviews and their findings.

Vawter and Martens (2019) gave a broad overview of language learning software, including 69 instances of CALL software in their analysis (which encompassed mobile applications for language learning as well). They analysed the CALL software of the time in terms of the software's possibilities for feedback, adaptation techniques employed, types of user input, and educational framework used. Their findings suggest that most instances of language learning software follow the learner's progress and are largely explanation-based in providing feedback. Furthermore, the reviewed systems showed a low level of adaptivity to the needs of the learners and exhibited little in the way of providing flexibility to the learning process.

A systematic review focusing specifically on mobile language learning was reported by Persson and Nouri (2018), who analysed a total of 54 scientific articles from 9 relevant scientific databases, published over a span of eight years (2010 to 2017). The analysis was performed by coding the papers by educational level of mobile learning implementation, research design, geographical location, learning context, role of technology, pedagogical practice, and learning outcomes. The results of the analysis reveal that the majority of reported educational interventions encompassing mobile learning took place in the formal context of higher education. Furthermore, mobile devices, most commonly smartphones, were usually used indoors rather than outdoors by the students. The review also identified vocabulary learning as the most common pedagogical practice (consistent with the previous research done in this field).

In their review of literature, Kacel and Klímová (2019) examined the effectiveness of mobile apps for English language learning by studying 16 relevant experience reports from the period between 2015 and 2019. Their conclusions suggest that there are significant benefits to employing mobile learning as part of language education, including enhancement of cognitive capacity of language learners, increased motivation in formal and informal language learning contexts, promotion of learner confidence and autonomy, and the ability to aid low-achievers in reaching the set study goals. However, the authors also emphasize that the effectiveness of this approach (i.e., of mobile learning) depends on meticulous planning and organisation by the teacher, which should be adapted to the needs of the students.

Booton et al. (2021) reviewed the evidence on the impact of mobile application features for learning a first language on children between ages 3 and 11, reported in experimental studies published since 2010. Their review included eleven studies and examined the effects of four distinct features of mobile applications for language learning, namely inbuilt narration, conversation prompts generated in real time, augmented reality possibilities, and the use of interactive hotspots on the screen. Their findings suggest that inbuilt narration can be beneficial for children's reading comprehension when they are just starting to read, that conversation prompts are considered to make the applications more effective as they encourage direct conversation, and that hotspots do not seem to play an important role in promoting story comprehension. Augmented reality is reported to increase student motivation for language learning and is able to draw attention to new vocabulary items that need to be learned.

2.4 Current review

The review presented in this paper differs from previous work in several key aspects, including:

- the time period, which covers 28 months from January 2020 to April 2022 (coinciding with the appearance of the COVID-19 pandemic during which a proliferation of mobile learning contexts was expected to surface);
- the technology focus, which is set specifically on mobile applications for language learning that can be used on mobile devices such as smartphones or tablets;
- the context of learning, which includes both in-class and out-of-class usage, either as part of a completely online or a blended approach, where a portion of linguistic communication and learning occur between the software and the learner (the teacher is not necessarily directly involved);
- the selected subset of characteristics of the educational intervention to be examined, which also includes the characteristics of mobile language learning applications used to implement these interventions;
- the selection of languages to be learned in a mobile environment, as there is no focus on any particular language;
- the examination of effects which are reported for a particular teaching and learning intervention.

3. RESEARCH METHODOLOGY

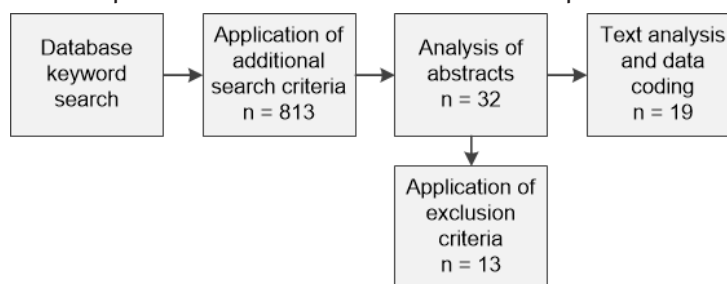
3.1 Data collection

The literature review described in this paper was conducted by examining relevant publications on mobile learning applications and their use in the language teaching and learning process from four scientific databases. The four selected databases include:

1. ACM Digital Library,
2. IEEE Xplore,
3. Web of Science (Core Collection), and
4. Scopus.

These databases were selected to represent broad scientific areas relevant to the multidisciplinary nature of the field of MALL. The first two databases mainly include papers from technical and social sciences, while the latter two cover research and practice relevant to MALL from the humanities and social sciences. An overview of the procedure for data collection is given in Graph 1.

Graph 1. A schematic of the data collection procedure



Source: Authors

In order to identify relevant publications to be included in the review, a set of relevant keywords was used to perform the search. The search string, in its basic form (later adapted according to the specifics of each search engine offered by a particular database), was the following: (“mobile language learning” OR “MALL” OR “mobile assisted language learning” OR “m-learning”) AND (“app” OR “application” OR “software”) AND “effects”. In addition to the search query, there were several other search criteria applied in order to reduce the number of publications that are out of the scope of this research:

- the publication period was restricted to include only papers published from the beginning of 2020 up to April 2022,
- only scientific papers published in peer-reviewed journals and conference proceedings were included,
- only papers featuring an abstract were included, and
- the language of publication had to be English.

The described query and the application of additional search criteria yielded a total of 813 publications across all four searched databases. In the next step, all the abstracts of the identified publications were examined for relevance, resulting in 32 publications to be further examined (the majority of disregarded publications were papers from unrelated fields, such as medicine, and the rest were papers completely unrelated to the topic of interest). However, additional exclusion criteria were applied in this step, namely:

- literature reviews were disregarded as they do not include a description of a particular educational intervention,
- virtual reality and augmented reality applications, games, and other software non-designated for language learning (e.g., social networks or messaging/chat applications such as WhatsApp) were also disregarded so as to include only straightforward mobile applications.

Given these exclusion criteria, 13 publications were removed from further analysis. A breakdown of the final 19 identified publications is given in Table 1 (for each database and for each data collection step).

It is worth noting here that 2 out of 19 publications intended for a full-text analysis had been identified as appearing in multiple database searches. One publication from the Web of Science database and one publication from the ACM Digital Library database also appeared in the Scopus database search. Therefore, the total number of unique publications to be analysed was reduced to 17.

Table 1. Publications yielded by the search query, additional criteria, and analysis of abstracts

Scientific database	No. of publications after additional criteria	No. of publications after analysis of abstracts	Searched fields
ACM DL	159	3	All fields
IEEE	474	5	All fields
WoS	89	1	All fields
Scopus	91	10	All metadata
Total	813	19 (17 unique)	

Source: Authors

3.2 Data coding

The analysis of the selected publications was performed by identifying and coding the characteristics of the mobile applications used to implement mobile language learning environments, together with the characteristics of the context in which it was done and the effects achieved. The following makes up the list of characteristics that were analysed and coded:

- application name,
- commercial software – identifies software as either commercial or non-commercial,

- context of teaching and learning – identifies the organisational paradigm of the teaching/learning intervention,
- teaching pedagogy – identifies the theoretical background employed;
- language being learned,
- language skill/aspect being targeted,
- role of the teacher,
- relatedness to COVID-19 – identifies whether or not the teaching/learning intervention is related to the COVID-19 pandemic, which may indicate how planned the educational intervention was,
- reported effects.

4. RESULTS AND DISCUSSION

The full-text review of the selected 17 publications yielded descriptions of 15 different learning and teaching interventions that used mobile applications for mobile learning. For the purposes of practicality, the results section is divided into several parts, depending on the research questions given earlier in the paper.

4.1 Software and the context of teaching/learning

This subsection presents general information about the mobile applications for language learning identified from the review of the selected full texts. Table 2 identifies the application name, whether the application is a commercial one, the context in which the teaching/learning intervention takes place, and whether the intervention is directly linked to the effects of the COVID-19 pandemic.

Table 2. General information regarding identified software and the learning/teaching intervention

Source	Application name	Commercial software?	Context	COVID-19 related?
(Schneegass et al., 2021)	Unlock App, Notification App, Standard App	No	online (out of class)	No
(Wang, Yuizono, 2021)	TED, Baicizhan Love Reading	Yes	blended (out of class)	No
(Safonov et al., 2021)	TrainChinese, LaoshiDict	Yes	blended (in and out of class)	No
(Seppälä et al., 2020)	KoToToMo Plus	No	blended (out of class)	Yes
(Imabeppu, Hasegawa, 2021)	m-Learning system	No	online (out of class)	No
(Yahuarcani et al., 2020)	BAKE	No	online (out of class)	No
(Refat et al., 2020 a) (Refat et al., 2020 b)	MATT	No	blended (out of class)	No
(Fang et al., 2020)	(Not given)	No	blended (in class)	No
(Barjesteh et al., 2022)	Visual Vocabulary Learning	No	blended (in class)	Yes
(Alharbi, Newbury, 2020) (Alharbi, Newbury, 2021)	(Not given)	No	online (out of class)	Yes
(Namaziandost et al., 2021)	Rosetta Stone	Yes	online (out of class)	No
(Esmaeili, Shahrokhi, 2020)	Memrise	Yes	blended (in and out of class)	No
(Daud et al., 2020)	(Not given)	-	blended (in and out of class)	No
(Dağdeler et al., 2020)	CollocatApp	No	online (out of class)	No
(He, Loewen, 2022)	(Not given)	-	blended (out of class)	No

Source: Authors

4.2 Teaching pedagogy

The examination of teaching pedagogy employed in the language teaching interventions with mobile technology yielded the results presented in Table 3. For each reported instance of pedagogy, identified in the full texts of the selected publications, corresponding publications are provided.

Table 3. Teaching pedagogy employed in mobile language learning interventions

Teaching pedagogy	Source
Task visibility approach	(Schneegass et al., 2021)
Personalized learning	(Wang, Yuizono, 2021) (Alharbi, Newbury, 2020) (Alharbi, Newbury, 2021)
Motivational design (framework)	(Seppälä et al., 2020)
Multimedia learning	(Refat et al., 2020 a) (Refat et al., 2020 b)
ARCS model	(Refat et al., 2020 a) (Refat et al., 2020 b) (Daud et al., 2020)
Zone of proximal development	(Fang et al., 2020)
Visual learning	(Barjesteh et al., 2022)
Universal design (for learning)	(Alharbi, Newbury, 2020) (Alharbi, Newbury, 2021)

Source: Authors

In only 10 out of 17 publications (or 58.8%) did the authors report explicitly on employing a particular teaching pedagogy or theoretical approach for their teaching intervention. The use of approaches indicated as *task visibility*, *motivational design framework*, *multimedia learning*, *zone of proximal development*, *visual learning*, and *universal design*, is reported in a single case only. Publications reporting on the same teaching intervention consistently refer to the teaching pedagogies they use.

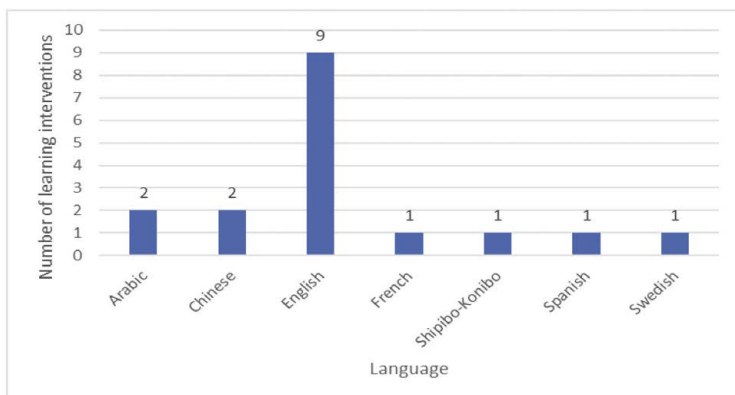
The results presented in this subsection offer a response to RQ1a.

4.3 Language

Regarding the languages being taught using mobile technology, seven of them were identified in the analysis, namely *Arabic*, *Chinese*, *English*, *French*, *Shipibo-Konibo*¹, *Spanish*, and *Swedish*. The distribution of the interventions across languages is given in Graph 2. In the intervention described by Schneegass et al. (2021), there are three languages taught within the same context (Spanish, French, and Swedish), while all the others focus on only one language.

¹ *Shipibo-Konibo* is a language spoken by the Shipibo-Konibo people of the Cantagallo community in the Peruvian Amazon.

Graph 2. Languages taught as part of the mobile language learning intervention



Source: Authors

A cross-referenced view of educational level and language is given in Table 4.

Table 4. A cross-referenced view of educational level and language

Language	Educational level			
	Pre-school	Primary school	Secondary school	University
Arabic		1		1
Chinese				2
English			2	7
French				1
Shipibo-Konibo	1			
Spanish				1
Swedish				1

Source: Authors

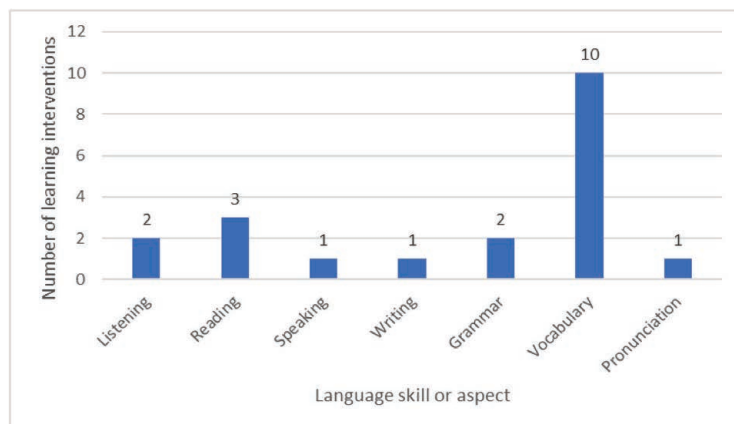
Furthermore, when examining languages that appear in MALL interventions covered by this review, it is important to note that in all but two cases languages that are taught and learned are done so as a foreign language: in the cases of BAKE (Yahuarcani et al., 2020) and the system described by Alharbi and Newbury (2020, 2021), Shipibo-Konibo and Arabic are taught as a first language, respectively.

4.4 Language skill/aspect

The analysis of the selected publications has yielded 7 language skills and/or aspects of language targeted by the mobile learning systems. These include all four traditional language skills (listening, reading, speaking, and writing), and three additional aspects of language (grammar, vocabulary, and pronunciation). The results of the analysis regarding language skills are summarized in Graph 3.

In the interpretation of the presented results, it is important to note that a single teaching/learning intervention may be targeting more than one language skill or aspect.

Graph 3. Language skills and aspects targeted by the mobile language learning intervention



Source: Authors

The results presented in this subsection offer a response to RQ1b.

4.5 Teacher role

Teacher roles identified in the process of analysing the selected publications are given in Table 5. In addition to each role, its source from the literature is given. It needs to be noted that not all publications offer details concerning teacher roles during mobile learning, as only 10 out of 17 (or 58.8%) of examined publications make a clear reference to it. There are 5 unique teacher roles identified by the analysis, namely *monitoring learning results and progress*, *content creation*, *offering feedback on learning*, *organising class time and mobile learning*, and *teaching the same content in the class setting*. It needs to be noted that there is only one publication claiming multiple teacher roles (see Seppälä et al., 2020).

Table 5. Teacher roles in mobile language learning interventions

Teacher role	Source
Monitoring learning results and progress	(Schneegass et al., 2021) (Wang, Yuizono, 2021)
Content creation	(Seppälä et al., 2020) (Yahuarcani et al., 2020) (Dağdeler et al., 2020)
Feedback on learning	(Seppälä et al., 2020) (Daud et al., 2020)
Organizing class time and mobile learning	(Fang et al., 2020)
In-class teaching of the same content (to the control group students)	(Barjesteh et al., 2022) (Namaziandost et al., 2021) (Esmaeili, Shahrokhi, 2020)

Source: Authors

The results presented in this subsection offer a response to RQ1c.

4.6 Effects of using mobile learning

The effects of using mobile applications for language learning were identified from the results portion of the examined publications, and are summarized in Table 6. For each educational intervention (Source column), an overview of the most important findings is provided (Findings column). Furthermore, negative or neutral findings regarding learning with mobile technology are marked in italic.

The results presented in this subsection offer a response to RQ2.

Table 6. Effects of mobile language learning interventions

Source	Findings
(Schneegass et al., 2021)	task embedding increases exposure to language learning and motivation to learn
(Wang, Yuizonon, 2021)	increased learning motivation, enhancement of reading proficiency, promotion of autonomous learning
(Safonov et al., 2021)	positive perception of learning, increased motivation
(Seppälä et al., 2020)	<i>low retention rates</i>
(Imabeppu, Hasegawa, 2021)	learning efficacy increased when the learner was physically active, increased vocabulary learning rate during activity, <i>activity during learning does not influence confidence</i>
(Yahuarcani et al., 2020)	increased learning results (as opposed to the traditional approach), facilitates self-learning
(Refat et al., 2020a) (Refat et al., 2020b)	increased learning performance (effectiveness), reduced cognitive load
(Fang et al., 2020)	increased comprehension (vocabulary and conversation), greater awareness of fluency- and accuracy-oriented strategies
(Barjesteh et al., 2022)	visual learning group outperformed non-visual learning group significantly in the post-test
(Alharbi, Newbury, 2020) (Alharbi, Newbury, 2021)	increased engagement, increased satisfaction
(Namaziandost et al., 2021)	<i>CALL version outperformed MALL group</i> , multimedia materials enhance vocabulary performance; multiple communication channels for learning contribute to better attainment
(Esmaeili, Shahrokhi, 2020)	statistically significant effect on collocation learning and retention
(Daud et al., 2020)	increased motivation to learn language, increased self-learning opportunities
(Dağdeler et al., 2020)	increased receptive vocab knowledge, <i>no effect in productive vocabulary knowledge</i>
(He, Loewen, 2022)	increased motivation for learning, <i>TOEIC scores remain the same</i>

Source: Authors

4.7 Discussion

The results of literature analysis, presented in the previous section, reveal the ways in which mobile applications for language learning implement (or complement) language teaching and learning practice, as well as the effects related to its implementation.

The analysis yielded 15 educational interventions in which mobile applications were used either in or outside usual language class time, and only 3 interventions were identified as having direct ties to the COVID-19 pandemic. Such a low number may seem unexpected given that, during the period in question, there was a strong need for some form of distance teaching and learning (which, indeed, mobile learning is able to provide). An explanation may be found in the fact that the initial transition from mostly in-class environments to completely online ones was done ad-hoc, so most teachers (and institutions, for that matter) preferred synchronous communication in organising their class time and individual activities, or did not have the time, skill, or means to organize activities involving mobile applications (e.g., Tomczyk, Walker, 2021). However, the number of other identified interventions using mobile applications may be indicative of the interest within the teaching and research community for this particular approach, so an increase in the number of publications in the near future may be noticeable.

There is a variety of mobile applications used to implement mobile learning in the examined publications: different software had been used in all the reported interventions. Out of the 17 identified mobile applications, 11 are categorized as non-commercial. Such software is mostly developed in a targeted way, either for research purposes or a particular teaching/learning setting. While commercial software is used “as is” and can hardly be customized to the needs of the teachers or learners (including its content, behaviour, feedback opportunities, and results analysis), non-commercial software is usually more flexible or already adapted for the specific context in which it is applied. This advantage, together with the need of teachers to address more specific language learning goals, may account for the increased popularity of non-commercial software for language learning via commercial mobile applications.

Even though only 10 out of 17 publications examined in this analysis report on the pedagogical principles underlying their approach to mobile learning, a diversity in approaches is noticeable. Eight different approaches have been identified, but only two of them feature in more than a single instance. Approaches based on motivational factors, which are often reported in the literature (e.g., Stockwell, Tanaka-Ellis, 2012; García Botero et al., 2019), seem to be the most often driving factor in the interventions examined in this review. Increasing student motivation for language learning, including self-directed language learning, is inherent in mobile learning approaches, and may lead to better learning results. Motivation may also be increased by the personalized approach to learning, implemented by the language learning software. Personalization mechanisms aim to deliver appropriate learning content, which is adapted to the needs of each individual interacting with the software, thus potentially positively influencing their motivation for learning. It can take many forms, the most common being learning path adaptation and adaptation of learning materials (see, e.g., Slavuj et al. (2017) for further discussion).

The results regarding the educational level at which mobile learning is implemented, as well as those regarding the targeted skill or language aspect, are in line with findings previously reported in the literature (see Persson, Nouri, 2018). Based on these findings, mobile language learning is most commonly introduced at the level of tertiary education, where more mature students can reap the benefits of a self-directed, flexible environment by actively assuming responsibility for their own learning (Lamy, 2013; García Botero et al., 2019). Research also indicates that, even

though mobile applications can be used to advance all language skills, most interventions focus on vocabulary learning (e.g., Klímová, 2019; Kukulska-Hulme, Shield, 2008; Persson, Nouri, 2018). The other language aspect featuring often in mobile learning is grammar, which is the second most frequently identified aspect in the current research. Other skills may be underrepresented both in research and in practice due to the physical characteristics of the devices (e.g., small screen size may prove inconvenient for writing or reading longer texts), too big demands on technology (e.g., automatic evaluation of a freely written text or speech recognition may be difficult and expensive to implement, sound reproduction software may require too fine a precision for the learners to jump to sections they are interested in), or the complexity of task design for particular skills (e.g., production of task texts, both written and spoken, requires significant time and effort, communicative and conversational tasks may be difficult to set up). Convenience is thus a factor that should be taken into consideration by the language teacher when organising mobile language learning activities.

Teacher roles during interventions with mobile learning identified in this work indicate varying degrees of teacher involvement. Based on the results, three broad teacher roles are identified. In the first group, there are teachers whose involvement in the mobile learning intervention is minimal, and students are encouraged to learn without direct teacher involvement – only through interaction with the software. In the meantime, teachers focus their efforts on teaching the same (or similar) content in the “traditional” way, within the language classroom. In all the identified cases, this is done to create the appropriate research setup that uses a control group of students in order to be able to compare their results with the results of the target group who are working independently with the software. In the second group, the teachers are not directly involved in mobile learning, but have a reactive role that complements independent student work. Thus, teachers either monitor the results and progress of students using the appropriate functions offered by the software or students’ progress reports, or they are somewhat more involved and communicate their feedback on learning directly to the students. This approach, in which the teacher has an advisory role, enables some control over the teaching/learning process, and may be used to steer learners in the right direction. The last group reflects a more active teacher role in the teaching process. In it, teachers participate in the creation of the materials that will be made available to students through the mobile application for language learning. Alternatively, teachers perform organizational activities trying to reconcile “traditional”, in-class language learning activities with activities done using mobile technology. This approach shows the highest degree of teacher involvement, and is appropriate in all previously discussed modalities of blended learning.

The reported effects of employing mobile learning among students are largely positive, and three of them need to be particularly emphasized. Firstly, the motivational aspect, as many publications point it out as one of their key findings. Students have reported increased motivation both during the process of language learning and when asked about their plans for the continuation of language learning. Such motivation-related findings may be significant for those teaching (and learning) contexts where a low motivation to learn a language has been recognized by the teacher. Even introducing mobile-supported activities as part of the usual, in-class sessions, may contribute to increasing the engagement of learners and their satisfaction with language learning, or their positive attitude towards it. Secondly, the performance aspect across all language skills

and language aspects is emphasized. There seems to be an abundance of evidence in support of efficiency and effectiveness claims of using mobile learning approaches, including better attainment of vocabulary, reading proficiency, or overall language comprehension, to name just a few. A contribution to teaching efficacy should also not be disregarded, as teachers may transfer some of their responsibilities onto the technology and reduce their direct workload (however, the indirect workload, such as activity organization, preparation, or feedback remains, as only the proper and comprehensive preparation of the teaching process with technology will result in positive outcomes). This body of knowledge may be used by the teachers to further supplement their in-class work with students (e.g., regarding recapitulation or skill reinforcement), with the goal of targeting and strengthening skills of their choice. Thirdly, the enabling aspect of mobile learning, which includes the facilitation of self-directed or autonomous learning, may be beneficial for those teachers who want to introduce mobile technology beyond mere class time and get students to learn any time and any place. This may prove to be an efficient contribution to and supplementation of what is done in direct teacher-student interaction.

Given the results yielded by this literature review, a set of recommendations for adopting MALL in teaching and learning practice may be drawn: shorter activities and micro-learning tasks seem to elicit positive learning outcomes; doing learning tasks should be encouraged regardless of time and space, and in such a way that extends on what was done during dedicated class time; try introducing MALL in low-motivation environments to boost interest for language learning; aim at more mature learners, especially those who are able to participate in self-regulated learning activities.

5. CONCLUSION

As mobile technologies continue to develop in their capabilities to support everyday activities, their use continues to grow in all areas of human activity. The field of language teaching and learning is not exempt from it: new approaches are becoming available, new (language learning) applications continue to appear, and novel contexts necessarily arise. This paper gave an overview of the current state of mobile learning using designated mobile applications (or apps) as part of language classes, across different contexts.

The most notable results of the analysis revealed a great diversity in learning software, teaching pedagogies (RQ1a), and teacher roles (RQ1c), indicating that there is no one right way to implement mobile technology into teaching and learning practice. Such results suggest that each educational intervention employing mobile technology is a case that should be approached individually, therefore the teacher should plan and adapt every aspect of it to the needs of the students and the set learning outcomes in order to achieve success.

The current study also confirmed some of the previous findings reported in the literature. Based on them, mobile learning is most commonly introduced for vocabulary and grammar learning, the two aspects of language most easily adapted to the requirements of the mobile learning context (RQ1b). However, other language skills were also identified in the examined publications, suggesting there are numerous possibilities (and modalities) for language teachers to introduce mobile learning to students. In the same vein, the level of tertiary education was confirmed as the

one at which mobile learning is most often introduced. While this is meaningful for practitioners employed in higher education, the author emphasizes the need to further examine the cases of employing mobile technology at the lower levels of education, as well.

The results concerning the effects of mobile learning reported in this overview are largely positive (RQ2). They indicate positive changes in learners in terms of motivation for language learning, learning efficiency and effectiveness, and performance results. Taken overall, the results reported by this literature review may offer significant incentive to further applications of mobile technology in language learning.

The current study does not claim to be a comprehensive one, but one that considers a relatively wide array of carefully chosen publications relevant for the selected topics within MALL. Similarly, the review is based on the publications found in four relevant databases, both from the technical and social sciences. However, there should be a significant number of publications, especially those featured at various MALL-oriented scientific conferences, workshops, or meetings, whose final publications are not indexed in the examined databases. Including those into further examinations would provide a much broader view of the MALL field as it currently stands.

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Pregledni rad

<https://doi.org/10.31784/zvr.11.1.12>

Datum primitka rada: 29. 11. 2022.

Datum prihvatanja rada: 2. 2. 2023.

KORIŠTENJE MOBILNIH APLIKACIJA ZA UČENJE JEZIKA U SKLOPU NASTAVE JEZIKA: PREGLED LITERATURE O SUVREMENOJ PRAKSI

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SAŽETAK

Tijekom posljednjeg desetljeća, učenje jezika pomoću digitalne tehnologije općenito, ali i pomoću mobilnih tehnologija posebno, dobilo je značajnu pozornost u istraživanjima i praksi. S jedne strane za to su zaslužni pozitivni aspekti koji se pripisuju učenju jezika pomoću mobilne tehnologije, dok su s druge strane tome uzrok brz razvoj računalne opreme (mobilnih uređaja) te računalnih programa (mobilnih aplikacija). Mobilno učenje jezika nudi priliku za korištenje mobilnih uređaja ne samo unutar fizičkog okruženja učionice, već i izvan nje, što ga čini vrlo pogodnim za uspostavu učenja na daljinu. U ovome radu istražuje se suvremena praksa povezana s implementacijom mobilnog učenja jezika u proces učenja i poučavanja kroz pregled relevantne literature područja, s posebnim naglaskom na mobilne aplikacije za učenje jezika. Pregled literature, u kojem je identificirano 17 relevantnih radova objavljenih tijekom perioda od dvije i pol godine (od siječnja 2020. do travnja 2022. godine), sistematizira opisanu primjenu mobilnog učenja prema značajkama konteksta u kojem se primjenjuje te prema učincima mobilnog učenja u sklopu nastave. Rezultati pregleda ukazuju na značajnu raznolikost u smislu mobilnih aplikacija koje se koriste, pedagoških pristupa na kojima počiva njihova praktična primjena, uloga nastavnika jezika, te pozitivnih učinaka na učenike, a koji se mogu pokazati korisnima praktičarima pri organizaciji jezične nastave uz primjenu mobilne tehnologije.

Ključne riječi: programi za učenje jezika, pregled literature, mobilne aplikacije, učenje jezika potpomognuto mobilnom tehnologijom, učinci mobilnog učenja