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Designing mobile language learning with Arabic speaking migrants

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ABSTRACT

Learning the language is crucial to be included in a new society. For migrants, the smartphone is a commonly used device for staying connected, which could also be used for language learning purposes. This research concerns mobile literacy with newly arrived Arabic speaking migrants to Sweden and the use of mobile learning as a means for integration. The purpose is to investigate how mobile technology can be designed to support migrants' language learning process. The research concerns technology development where versions of a mobile application (app) are explored from a bottom-up perspective with Arabic speaking migrants. A qualitative method approach is applied, built on design principles focusing on the construction of situated artefacts and evaluation of performance. The results show that intuitive design and engaging content with connections to everyday social situations play important parts in sustaining motivation to engage with an app.

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Mobile learning; design science research; migration; integration; language learning

1. Introduction

For the large number of Arabic speaking migrants from the Middle East, the mobile phone has become an indispensable device for communicating with social networks and managing everyday life in the new society (Al-Sabbagh et al., 2019; Kaufmann, 2018). The majority of Arabic speaking migrants coming to Sweden from 2015 and on, own a mobile phone to stay connected with friends and family (Bartram et al., 2018). However, mobile phones could also be used for learning purposes, such as learning the language (Bradley et al., 2017; Martiz & Recker, 2019). So far, there are few mobile applications dedicated for learning Swedish for Arabic speakers and overall research is scarce concerning the implications of mobile learning with migrants. One of the challenges for Arabic speakers in Sweden is the linguistic distance between the native language and the target one. Language is considered a key aspect for social inclusion and citizen participation in a new country, and one of the primary learning needs and goals for migrants (Majhanovich & Deyrich, 2017). It is relevant to understand how mobile phones can be used as a means of communication and learning a new language in the host society.

Mobile learning research deals with personal and collaborative learning taking place in institutional as well as informal settings, anywhere and anytime (Burston, 2015). The mobile learning research tradition concerns the interrelation between the device, learner and interaction (Martiz &

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Recker, 2019) and the original focus was on what could be done on mobile devices that was not applicable to a computer (Kukulska-Hulme & Pegrum, 2018). Nevertheless, it is as legitimate to ask the opposite, what restrictions there are on mobile devices in terms of learning, since mobile learning does not only concern the mobile devices themselves but also the mobility of learners and process of learning (Kukulska-Hulme et al., 2015). The downside of the ever increasing number of mobile applications (apps) is that it can also lead to the prevalence of erroneous, unexpected and sometimes irrelevant information (Wall et al., 2017), which could be misleading for migrant learners.

A common notion of Mobile Assisted Language Learning (MALL) is the idea of complete learning solutions intended for self-study (Nielson, 2011). However, MALL does not only involve mobile apps created specifically for language learning, but also other types of apps, such as for gaming, social networking, and translation (Rosell-Aguilar, 2017). In addition, with the advent of social media, mobile learning implies a turn towards self-regulation, in which people make active decisions (Littlejohn et al., 2016) and become actors in a self-motivated and empowered way (Castañeda & Selwyn, 2018).

Social media environments are boosted by motivational self-directed mobile learning activities dispersed through social networks, which cater for relationships that are spatially independent. Thus, mobile technology increases opportunities for creating and sustaining local and trans-local ties, where use of communicative resources in interaction are part of the learners' repertoires (Cabral & Martin-Jones, 2017). This calls for an inclusive design process for learning, which is also an important aspect that motivates learners (Laurillard, 2012).

Involving learners in the design process of learning is leading to a change, from user-centred design to user-involved design in iterative design processes (Nardi, 1996), where users themselves are building the knowledge base (Laurillard, 2012). Inherently, design science is a process of solving a problem where "knowledge and understanding of a design problem and its solution are acquired in the building and application of an artifact" (Hevner et al., 2004, p. 82). Therefore, we set out to investigate the needs and learning activities that Arabic speaking migrants in Sweden deem necessary in their learning of the Swedish language using a mobile language app. A design science approach has been adopted for three iterations where the design artefact is an improved version of a mobile language app.

2. Theoretical approaches in mobile learning

Mobile learning is suggested to enable learner-centered, personal, and ubiquitous learning (Sha et al., 2012) characterized by interrupted, sporadic activities, taking place in environments that are frequently far from ideal (Kukulska-Hulme & Pegrum, 2018). In existing research there is a focus on technological aspects and on what a mobile device can offer rather than looking at the pedagogical affordances and innovation perspective (Burston, 2015). The concept of affordance implies the inherent properties of an object and what defines its potential uses (Norman, 1988). Here, it is the role of technology as perceived by users, based on their background and needs (Reinders & Stockwell, 2017).

This study is informed by mobile human computer interaction (Martiz & Recker, 2019), as it is considering the relationship between people, mobile computer systems and their application on a daily basis. Based on mobile human computer interaction, Martiz and Recker (2019) developed a framework to examine mobile phone appropriation, i.e. "exploring, adapting, and adopting new uses for features in a technology, going beyond its intended regular use" (p. 16).

Through bridging activities, characterized as "immediate – and mediated – social, communicative, and informational needs" (Thorne & Reinhardt, 2013, p. 562), learners move between sites when meeting a new culture. Given that mobile learning provides leverage to implement bridging activities, one also needs to consider different kinds of learning a migrant can experience, such as formal learning and informal learning. There is research supporting the fact that informal and social learning is a catalyst of change and personal development (McGiveny, 1999), also for supporting local networks between migrant and non-migrant communities through the shift from formal education to informal and social learning opportunities (Morrice, 2007).

According to a design research approach, the engagement from the learner's part is something that drives learning (Laurillard, 2012). Design-based research is a series of theoretical approaches with a goal to design artefacts and practices in natural settings which tries to understand learning related educational phenomena (Barab & Squire, 2004). Design science research (DSR), grounded in informatics and engineering, aims at producing and evaluating situated designed artefacts in a number of steps, from defining a problem, to developing and evaluating a novel IT artefact that addresses the problem (March & Storey, 2008; Vaishnavi & Kuechler, 2008).

3. Purpose

This research focuses on migrants' mobile literacy and use of mobile technology for language learning. Our purpose is to investigate connections between content and functionality in MALL and how technical solutions match pedagogical affordances and the needs of newly arrived Arabic speaking migrants. The objective is also finding evidence for how self-motivation can be triggered through app development that could lead to user empowerment (Castañeda & Selwyn, 2018). To understand this, migrants' mobile literacy is scrutinized together with how mobile language learning is designed for migrants, connected to the use of mobile technology taking a DSR approach. Thus, the aim is both analytical; to understand the bridging activities the migrants are involved in concerning mobile learning, as well as design oriented; to investigate app development appropriate for migrant language learning. Our research questions are:

(1) What mobile langauge learning activities are Arabic speaking migrants engaged in when learning a new language?
(2) How can mobile language learning features be designed to support migrants learning a new language?

4. Methodology

This section describes the research approach and context. The study has a qualitative approach, with three case studies including surveys, observations from design workshops as well as interviews with participants.

Design based research is suitable for the study of innovation (Barab & Squire, 2004), dealing with real life problems that require solutions for a particular context. According to design principles in design science research (Vaishnavi & Kuechler, 2008) there are a number of design steps to take into consideration, which were implemented in our study, such as defining the problem, demonstrating that no adequate solution exists, developing and presenting a novel IT artefact that addresses the problem, evaluating the IT artefact enabling the assessment of its utility, articulating the value added to the IT knowledge-base and to practice, and explaining the implications for IT management and practice (March & Storey, 2008).

Investigating and analysing mobile language learning for Arabic speaking migrants, we addressed needs and challenges related to mobile literacy. The context of our study was *Swedish for Immigrants* (SFI) programmes. SFI is a national programme offered to all migrants in Sweden where each student follows an individual study plan without a joint start and end date for the courses. This flexibility means that students can move to the next course when they are considered ready and new students can start at any time.

4.1. Data collection

A case study approach lends itself to examining activities taking place in natural settings with events from participants' point of view. Such an approach calls for description of the situation, topic or issue

to be investigated based on the research question (Merriam, 2009), within an intrinsically bounded context.

Data were collected from three beginner programmes at two SFI schools. From originally inviting 52 Arabic speaking students, our data are based on 34 participants who were present throughout all weeks of the studies. Requirements of the participants were having Arabic as the first language and being equipped with an Android smartphone. Concerning background and language experience of the 34 participants, 24 were from Syria, six from Palestine, four from Iraq. The majority (19) had been in Sweden between 1.5–2 years. The distribution of gender among the participants were 14 female and 20 male in ages ranging from 18 to 65. They had a varied professional and educational background, where the majority had education equivalent to secondary school and up.

The vast majority of the respondents did not speak any other language than Arabic prior to starting their Swedish classes. Four participants spoke other languages apart from Arabic; English (2), French (1) and Kurdish and Assyrian language (1). 13 participants spoke Swedish less than one hour per week, 21 out of 34 estimated that they had an opportunity to speak Swedish between 1–3 h per week outside of their Swedish classes.

Our MALL app prototype development was tested in three progressive iterations.

Based on our pre-studies (Bradley et al., 2017), the app contained drill-based exercises with everyday phrases connected to pronunciation training of Swedish, focusing on listening, and speaking skills. The development was expanded further during the iterations, with follow-up multiple choice exercises and functionality allowing users to share content.

The participants were engaged in in-depth testing during two weeks in November 2017 (Group A in School 1) and three weeks in April 2018 (Group B in School 2), and three weeks in December 2018 (Group C, School 2) (see Table 1). The participants in Group A and B were full time students at the Swedish language learning programmes, whereas participants in Group C were learning Swedish as part of a work internship programme. As the development of the app was progressing during our studies, the participants in Group B and C tested the app for a longer period than Group A.

The study adheres to relevant regulations of informed consent and confidentiality in research within the humanities and social sciences stated by the Swedish Research Council.

4.2. Procedure

The three studies were similar in setting with recurrent design (see Table 1). In the first workshop, all three groups filled out a *survey* concerning digital literacy; use of mobile technology, smartphones and apps, and formal and informal learning of the Swedish language (see Appendix A). The survey

Table 1. An overview over the distribution of the 34 participants in the three groups, their test periods, methods of data collection and context.

Group	Iteration and test period	Method	Participants fulfilling all weeks	Context of questions asked
Group A	First iteration 2 weeks Nov 2017	Survey Workshop on user driven design	13	Background of participants and mobile literacy Workshops about the Minclusion app
Group B	Second iteration 3 weeks Apr 2018	Survey Workshop on user driven design Interviews	13	Background of participants and mobile literacy Workshops about the Minclusion app Focus group interviews with questions about the Minclusion app Pair interviews about downloaded language learning apps (10 of the participants)
Group C	Third iteration 3 weeks Dec 2018	Survey Workshop on user driven design	8	Background of participants and mobile literacy Workshops about the Minclusion app Questions about multi-user function in the Minclusion app

answers were coded, categorized and analysed. Also in the first workshop, the users were assisted in downloading our app on their phones. Each week, there were follow up meetings with design workshops where app usage, functionality, content and improvements were brought up. In addition, Group B, had focus group interviews and pair interviews (see Appendix B). The surveys, workshops and interviews were all in Arabic, but translated into Swedish (and English for research dissemination purposes). The analysis of the data took place after each study, respectively. The technical development was conducted in an open environment in the Java programming language in *Android Studio*.

The *observations* were conducted in the design workshops, set up as supported interactions with the app to be tested. The participants could ask for assistance and clarifications during the workshop as they elaborated on the content and navigated in the programme (see Appendix B). The researchers, on their part, made field notes on the usability of the app during the workshop session. The field notes were analysed and a list of prioritised development features were listed. During the workshops, additional information about existing mobile language learning apps and lack of such apps were brought up by the respondents, adding to the rich descriptions of the current MALL situation.

Focus group *interviews* were conducted after the second week workshop in Group B, in order to obtain additional input about user experience of the app. Further, in the third week of Group B's iteration, ten of the participants volunteered to be asked complementary interview questions in pairs about their mobile literacy of existing language learning apps. Here, the participants were asked more in-depth questions about app usage for language learning and about their experiences of the apps, including how long and how often the apps had been used. The interviews were audio-recorded and subsequently transcribed verbatim with the purpose of capturing the fundamental meaning of utterances. The transcriptions indicated who spoke, what was said and how it was expressed. The transcriptions were coded and analysed according to questions brought up (Appendix B). Citations of relevance were identified as excerpts and citations from the interviews.

Triangulating by comparing findings across the analysed data: survey, observations and interviews, was a validation strategy in this research.

5. Results and discussion

This section presents the findings from the collected data, which were used to identify the problem to design a novel IT solution, subsequently evaluated by users. The section is set up according to the development steps of design science research by Vaishnavi and Kuechler (2008), starting with identifying the problem and lack of adequate existing solutions, then presenting a novel IT artefact that addresses the problem. The final steps are evaluating the IT artefact, articulating the added value, and providing implications of the design for practice.

5.1. Problem and existing solutions

Our results show that all respondents had a mobile phone and six out of the 34 respondents also had access to tablets and two had access to three devices; smartphone, tablet, and laptop. Most respondents used their mobile phones consistently during the day, switching between several social media apps. Only one reported little use of the mobile phone. There is a lack of motivating apps designed for learning Swedish everyday conversation in the new society for the target group. Existing apps are primarily focusing on general vocabulary training (Bartram et al., 2018).

Among the respondents, there was a preference for learning spoken language. The most commonly used apps were voice calling and text messaging services (see also Bradley et al., 2017). All but one used *WhatsApp* and most had at least one more additional messaging app. Further commonly used apps were *Google Translate*, *Facebook*, and *YouTube,* used by 29 out of the 34 respondents (see question 9 in Appendix A).

To the question if the respondents had used language apps to learn Swedish, Figure 1 displays an active group. Apart from the first four apps which were provided in the survey (*Duolingo*, *Språkkraft*,

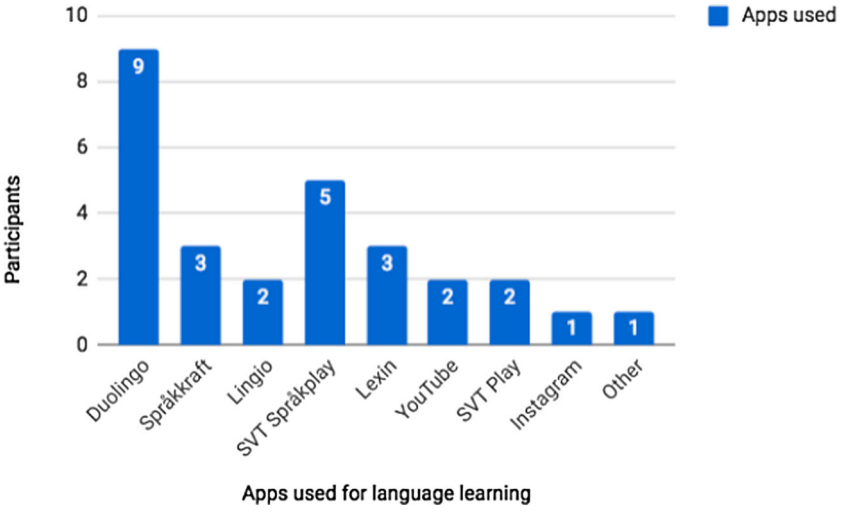

Figure 1. Results from the survey, Question 10. Have you used any of these language apps on your phone to learn Swedish? (see Appendix A).

Lingio, *SVT Språkplay*), it was also possible for the respondents to add more apps in subsequent open text fields. Additional apps provided were *Lexin* (an online dictionary), *YouTube*, *SVT Play* (the online version of the Swedish national TV), *Instagram*. The additionally stated apps are originally not designed only for learning Swedish. 22 respondents claimed that they are using or have used between two and eight apps for language learning purposes. 12 respondents, on the other hand, had not used any apps for language learning for various reasons, such as not having heard about them, not having time, finding them uninteresting or inefficient.

Concerning use of additional apps, the majority (80%), mentioned translation resources as a language learning tool. The respondents showed awareness of the necessity of making competent judgements of different meanings of words and translations:

> Sometimes we need a meaning for a specific word but we cannot find it in the *Lexin* app, maybe because the word is very old. So we go to *Google Translate*, but it gives us the wrong meaning. (Pair interview, Group B)

Our data suggest that the respondents preferred multimodal functionality provided by apps such as *YouTube* and *SVT Språkplay*, the latter being the second most used language learning app among the participants. *SVT Språkplay* provides the news with subtitles and subsequent follow-up questions and is commonly used for language training:

> I like *SVT Språkplay*, because you can read and hear the text at same time. And it is a multi-subject app, which has videos about sport, news, daily life. (Individual interview, Group A)

In a similar vein, a novel IT solution should make use of multimodal formats, such as video and audio, and conversations that teach pragmatic use of words, rather than words in isolation, which is mentioned in this quote:

> It [*Duolingo*] does not provide conversations, I did not like reading from apps, I like listening to conversations. (Individual interview, Group A)

In sum, our results display that migrants use a range of apps and digital resources as language learning tools, which require quite advanced mobile literacy. Further, our results show that there is clearly a lack of engaging solutions with interactive training. The development of our own app in three iterations is an attempt to explore content and functionality lacking in existing apps.

5.2. Presenting novel IT artefact

Our artefact, an app prototype, was developed and tested in three iterations with the three SFI groups by means of a combination of methods; survey, observations and interviews. The app development iterations provide an answer to research question 2, how mobile language learning activities can be designed to support migrants learning a new language. Each iteration first presents the focus of the iteration, then the analysis of the data from the respondents and the conclusions to inform the next phase of development.

5.2.1. First iteration of user-driven design

Focus of iteration: The first app iteration, with Group A, focused on phrases from users' everyday situations, dialogues and vowel training (see Figure 2), identified as features in need of target for learners of Swedish (see, e.g. Thorén, 2014). The functionality allowed presentation of text, audio and short videos, recording of speech, speech tempo regulation and possibility of taking quizzes with previous words and phrases. There was no sign-in feature, for ease of access, and all content was available offline. Also, there was a flexibility for the user to move between any part of the app.

Respondents: After one week's testing, the respondents engaged in a design workshop (see Table 1), displaying how they had used the app during the week. Five respondents had not used the app for different reasons, such as moving to a new house, not liking it, being too busy with other things. From the eight respondents who did use it, six had used it a few times and found it useful and two had used it several times a day and found it very useful. The respondents gave a few examples of how they had used the phrases in their everyday speech during the past week, indicating that the app supported self-motivation to a certain extent (Castañeda & Selwyn, 2018).

Concerning improvement suggestions, the respondents were asking for alternative ways of practising speech, since it was perceived intimidating to make their own recordings, even when being alone at the time of recording. Some of the design features were not intuitive, for instance finding

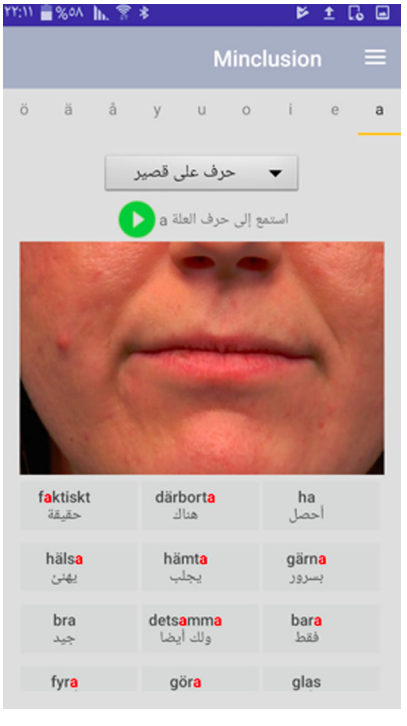

Figure 2. A screenshot from the first iteration of the app prototype, Minclusion, displaying Swedish vowel practice.

the videos displaying a mouth pronouncing words (see functionality in Figure 2). It was also suggested that slower speech tempo of the recordings would be helpful, even though tempo regulation was already implemented.

The respondents found that there was too little content to practise and proposed more everyday phrases such as, communicating with schools and potential employers, going shopping and cooking. Respondents were taking exercises once only, which brought us to the essence of implementing repetition, one of the core elements in language learning (Rosell-Aguilar, 2017).

Lessons learned: The analysis of the first version led to the following design considerations: simplifying the navigation further and improving the layout with more images, refinement of the recording function, including more dialogues to practice with instructions that encourage repetition by the user. Finding reasons for users not engaging in making self-recordings needed to be explored. The content area grocery shopping and cooking was planned for. Also, a user interface in both Arabic and Swedish was implemented to make the app accessible to both teachers and students.

5.2.2. Second iteration of user-driven design

Focus of iteration: In the second iteration, with Group B, langauge learning and content were expanded with quizzes. Further dialogues were added from the context of authorities and emergencies. In terms of functionality, new navigation buttons and paths were implemented to see if that would trigger self-recordings. Also, additional exercise functions of rearranging words and fill-in-the blank were added. Cook & Learn (see Figure 3) was introduced, where users would learn Swedish through cooking, which required compression of videos and images to keep the app size down. Also, sticking to an offline version was abandoned, since parts of the content required Wi-Fi to run. In turn, a first step towards a function with user-generated content was started, where users would be sharing recipes.

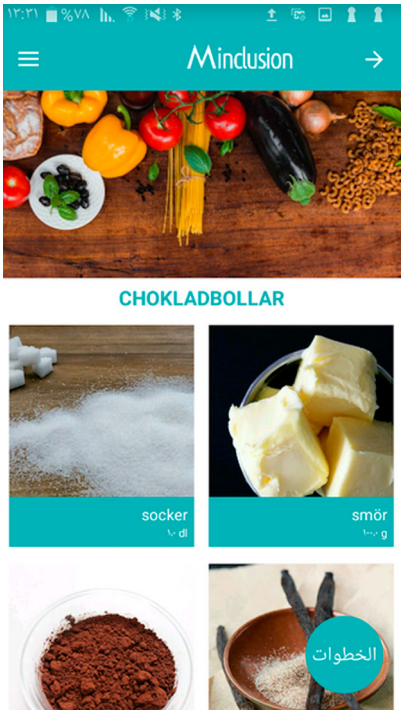

Figure 3. Screenshot of the second iteration of the app prototype, Minclusion, the Cook & Learn feature.

Respondents: The focus group interview with Group B showed that six out of 13 participants had engaged with the app a number of times to practice their Swedish. Only two persons had not used it at all, due to technical or family reasons. The respondents gave concrete examples of everyday situations where they found the app supportive. However, they emphasized the essence of using it continuously in order to learn with the app. Three respondents had used phrases straight from the app in everyday situations, in a grocery store, at a café and at the Social Insurance Agency:

> I used it in Försäkringskassan [Social Insurance Agency] to tell them that I am ill, I used three or four phrases from the app, and it helped me to feel comfortable when I was talking, and it gave me confidence. (Respondent in focus group interview, Group B)

The respondents had used the app at home, on local transportation and when socializing with others. After emphasizing that the self-recordings would not be saved on the phones, the respondents now claimed that they had recorded themselves, paying specific attention to pronunciation of contrastive sounds not existing in Arabic as well as recording of phrases. One of the respondents gave an example of how practicing Swedish sounds had improved the respondents' linguistic awareness:

> I recorded to practice on the p and b letters, we can't distinction between them in our pronunciation. We cannot say the letter p, we pronounce it as b. So, recording helped me to recognize my pronunciation errors. (Respondent in focus group interview, Group B)

Concerning improvements, the respondents proposed that using interactive videos would be a useful feature in the next version of the app. Most of them were already familiar with *YouTube* and gave examples of channels they used when learning Swedish.

Lessons learned: For the third iteration, two multi-user functions were implemented and tested. Also, *YouTube* films from Arabic – Swedish learning channels were selected and connected to existing exercises in the app.

5.2.3. Third iteration of user-driven design

Focus of iteration: The third iteration, with Group C, focused on adding *YouTube* material for extra practice and implementation of a multi-user function with a channel that could be accessed by several users. We developed a functionality allowing users to be connected for sharing of content, which would encourage activity. Users could share cooking recipes and work-related questions via the app. A more state-of-the art user interface was also implemented, with a synchronized colour scheme.

Respondents: The multi-user function was tested with Group C, consisting of persons participating in an internship programme for migrants learning Swedish at the workplace, working as caretakers in housing areas. Under "What is this?" (Vad är detta?) the users could choose one of three modality options: "Upload a photo" (Ladda upp bild), "Type text" (Skriv text), "Record audio" (Spela in ljud) (see Figure 4). The teacher compiled the submissions to be discussed in class which would benefit the internship.

This engagement in informal and social learning has a potential of triggering personal development (McGiveny, 1999) in offering informal and social learning opportunities (Morrice, 2007). The next steps would be implementing more gamification and a rating function to the multiuser-function. The varied and extra training *YouTube* were appreciated.

5.3. Evaluating the IT artefact

The combination of qualitative methods ensured assessment of the utility and design of the IT artefact, as proposed by March and Storey (2008). The objective was finding evidence for how self-motivation and user empowerment can be triggered (Castañeda & Selwyn, 2018) which the interviews provided ample input for. The following quote shows that in order to trigger motivation the content is connected to realistic situations:

> This app helps us to understand people better. Indeed, for example I heard yesterday in a café the employee said to a customer "Is that all?" [Var det bra så?]. I immediately understood the meaning of the phrase, because I saw this phrase in the app. (Respondent in Group C)

Most respondents requested more examples and topics in the app, such as conversations that could be useful when going to the hospital, teacher's meeting and the gym. In the third and final workshop with Group C, we could evaluate the function for user-generated content and the multiuser-function, where learners are connected, which has the potential to make users active in decisions involving self-regulation (Littlejohn et al., 2016).

5.4. Added value and implications for practice

Although the number of existing apps on the market is increasing, the design is still connected to aspects inherent in the technology, at the expense of the pedagogical affordances (Burston, 2015). Our research suggests that usage is tightly connected to practical everyday situations where an app will make a difference, for instance when seeking to be understood in everyday situations. An app cannot solve all language issues when migrating to a new country. However, informal learning with content that can be useful and shared with others, is suggested to add to the pace of integration, since everyday situations can trigger communication in the new society (Cabral & Martin-Jones, 2017). Social connections through mobile devices are vital incentives for informal learning (Hager & Halliday, 2006). Therefore, implementing affordances that connect users is suggested to trigger motivation for users. This could lead to bridging activities discussed by Thorne and Reinhardt (2013).

Our results show that newly arrived migrants need means to learn how to communicate in the new language. Although the migrants were active mobile phone users, they had difficulty finding a Swedish language learning app that supported their everyday lives. Instead, they were diligent users of apps for translating and looking up words in dictionaries, proposed by Rosell-Aguilar

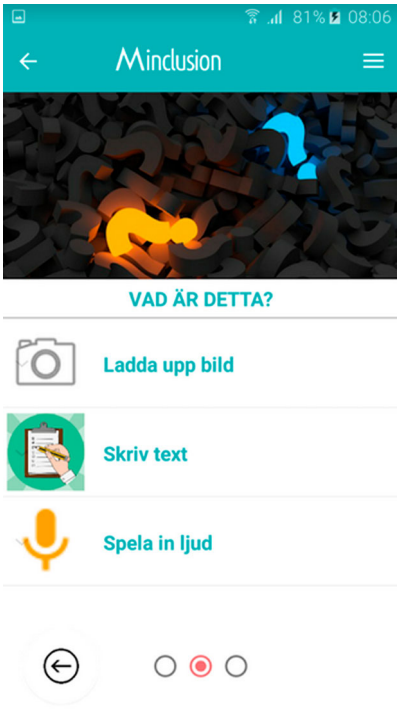

Figure 4. Multiuser function in our app prototype, Minclusion, allowing users upload a picture, a piece of text or an audio file, subsequently picked up by the teacher in class.

(2017) to be a commonly used app type, also in language learning. Kaufmann (2018) and Safa'a and Hanna (2017) also showed that language learning apps in terms of translation services are vital tools for Syrian refugees when navigating in society.

Our research adds to the debate of what drives the use of an app for learning. Our participants were engaged in learning Swedish in order to be integrated in Swedish society. The respondents who claimed to make regular efforts using the app stated that they increased their language skills. Being motivated, triggers the time spent with the app, which has a potential for language learning development.

6. Conclusions

The respondents in our study display a mobile literate group who are interested in engaging in MALL. However, there is a lack of motivating MALL apps for the target group. Our study combines the design of content, technical functionalities and pedagogical affordances, basing the argumentation on migrants' mobile literacy and their bridging activities combined with strong motivation for self-regulated learning. Concerning research question 1, the combination of research methods gave a rich picture of what mobile language learning activities Arabic speaking migrants are engaged in, such as translating words and watching YouTube films.

This study applied a design-oriented approach: explaining the lack of features to support everyday language learning for migrants, suggesting and developing a mobile technology feature to address the problem, and evaluating the design process. This gave input to research question 2, how mobile language learning activities can be designed to support migrants learning a new language. Embedding social features in an app, such as user-generated content functions and gamification will likely improve motivation among users. In addition, participating in the design process makes learners part of building the knowledge base (Laurillard, 2012).

7. Limitations and future research

Although, this project explores a specific group of migrants and their mobile usage, the results of the DSR procedure could be transferable when designing apps for other groups of migrants from other language groups.

Studying migrants in the Swedish For Immigrants (SFI) environment is challenging since students enter and exit the programme continuously. Therefore, the number of students who were first recruited was significantly higher than the actual number (34), who were participating during the whole period.

Another challenge is the small existing body of content developed for users to test in the various iterations of our app. Short studies of iterations are therefore more productive. The thick descriptions in the case study format provided ample evidence for our results, though. Implementation of functions that allow for user-generated content and multi-user, interaction shows that users' learning will benefit from being connected with others. Following the steps in design science research gives rigour to pedagogical development of an IT artefact.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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