Exploiting mobile technology affordances to support second language students using affective learning

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ABSTRACT

Self-regulated learning (SRL) - which relates to challenges concerning both cognitive and affective learning domains - is directly associated with students’ academic performance. It is especially critical for second language learners who need to employ SRL strategies and skills to be able to acquire the target language effectively. However, these students need help to develop their SRL, since the majority of them are not capable to make accurate judgments about their learning processes.

This study aims at facilitating second language learners to develop their affective learning skills and strategies needed for their successful acquisition of a studied second language. In this design-oriented case study, a special mobile tool, ATLAS (AffecTive LeArning Srl) was designed and evaluated with 13 second language students through semi-structured interviews. All the interviews were carried out by the author of this thesis. Written informed consent was obtained from all participants for their issues to be utilized for this work. The interview data was later anonymized. The results showed that 85% of the study participants exhibited positive attitudes towards the use of affective learning activities in the tool to support their development of SRL during their second language studies. In particular, the ATLAS tool was perceived to be able to increase student motivation for SRL and to increase their awareness of their SRL progress.

All in all, this study stresses that it is beneficial to use technology-supported affective learning in order to assist students in their development of SRL skills, strategies, and knowledge needed for their successful second language acquisition. From a practical perspective, this study also provides a tool and several design guidelines that should be considered by designers when designing similar tools.
**Sammanfattning**

Självreglerat lärande (SRL) - som avser utmaningar som rör både kognitiva och affektiva inlärningsdomäner - är direkt kopplat till studenters akademiska prestationer. Det är särskilt viktigt för andraspråkstudenter som behöver utveckla sina SRL-strategier och färdigheter för att kunna lära sig målspråket effektivt. Dessa studenter behöver dock hjälp med att utveckla sitt SRL, eftersom majoriteten av dem inte kan göra exakta bedömningar om sina inlärningsprocesser.

Denna studie syftar till att underlätta för andraspråkstudenter att utveckla sina affektiva inlärningsförmågor och inlärningsstrategier som behövs för att förvärva det valda andraspråket effektivt. I denna designorienterade fallstudie designades och utvärderades ett speciellt mobilverktyg, ATLAS (AffecTive LeArning Srl) app. Datainsamlingen genomfördes genomsemistrukturerade intervjuer med 13 japanska andraspåkstudenter. Alla intervjuer genomfördes av författaren till denna studie och deltagarnas skriftliga medgivande samlades in. Intervjudata har anonymiserats senare. Resultaten visade att 85% av studiendeltagare hade positiv inställning till användandet av affektiva lärsaktiviteter i verktyget. I synnerhet upplevdes ATLAS appen kunna öka motivationen hos studenterna för SRL och att öka deras medvetenhet om deras framsteg i SRL.

Denna studie visar på att det är fördelaktigt att använda teknikstödet för affektivt lärande för att hjälpa studenterna att utveckla deras SRL- färdigheter, strategier och kunskap som behövs för att deras framgångsrika andraspråkinlärning Ur ett praktiskt perspektiv, erbjuder denna studie också ett verktyg och flera relevanta designriktlinjer som bör beaktas av designers av liknande verktyg i framtiden.
ABSTRACT

Self-regulated learning (SRL) - which relates to challenges concerning both cognitive and affective learning domains - is directly associated with students’ academic performance. It is especially critical for second language learners who need to employ SRL strategies and skills to be able to acquire the target language effectively. However, these students need help to develop their SRL since the majority of them are not capable to make accurate judgments about their learning processes.

This study aims at facilitating second language learners to develop their affective learning skills and strategies needed for their successful acquisition of a studied second language. In this design-oriented case study, a special mobile tool, ATLAS (AffecTive LeAming SrL) was designed and evaluated with 13 second language students through semi-structured interviews. All the interviews were carried out by the author of this thesis and participants’ written consent was collected. The interview data was later anonymized. The results showed that 85% of the study participants exhibited positive attitudes towards the use of affective learning activities in the tool to support their development of SRL during their second language studies. In particular, the ATLAS tool was perceived to be able to increase student motivation for SRL and to increase their awareness of their SRL progress.

All in all, this study stresses that it is beneficial to use technology-supported affective learning in order to assist students in their development of SRL skills, strategies, and knowledge needed for their successful second language acquisition. From a practical perspective, this study also provides a tool and several design guidelines that should be considered by designers when designing similar tools.

KEYWORDS

Mobile Technology, Affective Learning, Self-Regulated Learning, Second Language Acquisition, UX Design

1 Introduction

The concept of self-regulated learning (SRL) has been emphasized in the education area for more than three decades [1, 3]. SRL “gives an overview of methods for guiding students to learn on their own” [2]. Self-regulated learners plan their own study goals, monitor their study performance, and reflect on their study behaviors. They also develop highly autonomous study progress and show proactive attitudes because they are aware of their strengths and limitations during the learning progress [2].

However, earlier research has shown that SRL is difficult for students, as the majority of them are not capable of accurately judging their learning processes [9]. And without additional support, students often misjudge their understanding of learning materials [17], which can negatively influence the remainder of the learning process [4].

Second language learners face challenges related to both cognitive (knowledge) and affective (attitudes) learning domains; both constitute student’s SRL. This thesis focuses in particular on the affective part that has been proven to be crucial for second languages. Stern (1983) states that “the affective component contributes at least as much and often more to language learning than the cognitive skills” ([18], p.386)

Recent advances in the use of digital technology in education have shown positive results, including the use of mobile technologies for second language acquisition in both formal and informal learning settings [19]. However, technology-assisted support for fostering second language learners’ SRL is rarely offered [8]. Besides, to our knowledge, there are no tools that specifically target students’ development of affective learning strategies and skills. Second language learners would benefit from the use of mobile technology, but they would need extra help in terms of the use of critical SRL strategies [5].

This study was conducted in close collaboration with the Kanda University of International Studies (KUIS, Japan) that offers campus-based special learning modules aiming at fostering second language students’ SRL, needed for their successful acquisition of the targeted second language.

To facilitate students’ development of SRL, this study uses and designs mobile technology, with a focus on the development of students’ affective SRL skills and strategies which are seen as one key component of SRL [15]. Affective learning - a key component of SRL - helps students to regulate their SRL progress and to create an affective learning experience [15]. It is “directed at coping with the feelings that arise during learning, and lead to an emotional state that may positively, neutrally or negatively affect the progression of a learning process” [14, p.2].

This study aims to answer two research questions:
How can mobile technology be effectively used to design and support second language students’ development of affective learning skills as a key part of their self-regulated learning?

What are the students’ perceived attitudes towards the design technology-supported solution to assist their self-regulated learning?

2 Background and Theoretical Foundations

2.1 Self-regulated Learning

SRL is defined as "the self-directive processes by which learners transform their mental abilities into academic skills" [2, p.3]. SRL includes the cognitive, metacognitive, motivational, and affective learning aspects [16]. According to Zimmerman's cyclical model of self-regulation (see Figure 1, [2]), which is used in this study, SRL consists of three mutually related phases: forethought, performance, and self-reflection. Cognitive, metacognitive, motivational, and affective aspects of learning occur during these three phases and influence the development of SRL.

![Zimmerman's Cyclical Model of Self-Regulation](Image 1)

Figure 1: Zimmerman's cyclical model of self-regulation [2].

2.2 Affective Learning & Second Language Learning

When students start to acquire a new second language, they are also faced with adjusting to a new culture and balancing their identities [6], since a new language often represents an unfamiliar culture. Rao and Torres [6] suggested that second language learners benefit from emotional or affective learning. In another study, Brown [7] found that affective learning is also important for second language learners to reduce their anxiety and facilitate their learning progress. Brown also suggested that self-regulation of affect will enhance the study achievement [7].

Using affective learning is not a new approach to support second language learners in their development of SRL. By using affective learning activities – frequently in physical learning settings - student engagement and motivation for second language acquisition were found to be increased [8]. Affective aspects of learning in this study explained in terms of student emotions towards SRL activities linked to their second language studies.

2.3 Affective Learning & Emotion Theory

In this thesis, students’ development of affective learning is seen in terms of their emotions during their studies. Pletcher's theory is used in this study as a design framework to visualize affective learning scenarios and integrate them into the ATLAS tool. Humans have thousands of emotions, but according to Plutchik, only eight primary emotions are the foundation for all [14]. They are joy, trust, fear, surprise, sadness, disgust, anger, and anticipation. These eight emotions (Image 1) have been integrated into the ATLAS app to help students to plan, to monitor and to reflect on their own feelings regarding their institutionalized second language learning activities.

![Affective Learning & Emotion Theory](Image 2)

Image 2: Eight emotions, adapted from [14].

2.4 Technology Support for SRL

Earlier research has shown that students use different learning tools to organize their learning processes [8]. However, existing learning software offers poor and/or limited support for SRL [8]. Also, existing tools are often offered in a form of web-based tools, which limits student access (i.e. lack of internet connection will limit student access to web-based tools) and use of such tools across different learning settings [26]. One example is the nStudy tool [26], i.e., a rich web-based internet application for personal learning based on an agentic model of SRL [27].

Moreover, there are no existing tools that support the development of SRL among second language learners. Considering the importance of fostering students SRL and the existing affordances of mobile technology, it is necessary to develop technology-supported tools to support second language students’ development of SRL strategies, skills, and knowledge in educational settings.

2.5 Culture & UX Design

Culture plays an essential role in the success of a product or system as end-users around the world prefer to use
technology according to cultural preferences [4]. Considering the cultural factor in designing mobile technology-assisted learning software will increase the users’ satisfaction [11]. Therefore, in order to ensure the usability and usefulness of the mobile tools, designers need to take the cultural factor into account [12]. Hence, in this study, in order to increase the Japanese students’ satisfaction, the graphic design of the ATLAS app was adopted from typical Japanese patents, such as the traditional Japanese architecture, cherries, and Japanese travel map (for more, see Section 6).

3 Case Description

The present case study was conducted in close collaboration with the Self-Access Learning Center (SALC), i.e., a learning community at Kanda University of International Studies (KUIS) in Japan. At SALC, students learn how to become self-regulated learners in order to facilitate their second language acquisition. Currently, SALC offers a SRL curriculum for students to acquire SRL skills, strategies, and knowledge [10] needed for their successful acquisition of the target studied language. The curriculum has two different structures: one class per week and two modules done by students outside of class [10].

SALC offers two separate modules for students. Each module includes several units. The first module (SALC module 1) is about how to become a good self-regulated learner. In this module, students need to learn i) how to set up learning goals, ii) how to find useful learning strategies and resources, and iii) how to write learning journals as a part of their self-reflective learning process. For this module, students need to attend the classes lead by learning advisors, to participate in relevant workshops and to join English speaking language cafe at the yellow sofas, a physical study place at SALC (Image 2).

Image 2: Collaborative learning setting at the yellow sofas.

In the second module (i.e., a follow-up module), students are asked to apply their SRL knowledge acquired from the first module to their second language learning activities. In this module, there are no mandatory classes and/or workshops; instead, students meet with assigned learning advisors individually on a regular basis. With the help of learning advisors, students try to set up both their short-term (i.e. daily and weekly) goals as well as their long-term (i.e., month and semester) goals. Each week, students need to set up their weekly language learning plan, follow up that plan, self-monitor their learning activities, and write related self-reflections in their learning journal (in which they summarize what activities they did during the whole week, whether they met their weekly goals or not, and also feedback for their learning advisors).

Most students at SALC study English as their second language. SALC instructs these students to use tablets as their main learning tools. However, presently the SRL modules’ materials are largely offered as paper-based materials to the students. This creates a gap between the institution’s instructions to use tablets, the students’ everyday use of their mobile devices (e.g., smartphones) and the offered SRL materials. Thus, this study aims to fill in this gap by designing a mobile technology-assisted SRL tool that aims to support students in their learning.

4 Method

The use of emotion icons in this project is seen as a way of communication between learning advisors and students. That is, the emotions selected in the ATLAS app by students (while studying their second language) are also aimed at helping learning advisors to understand the student’s feelings of specific learning tasks presented in the app.

Figure 2: Design Science Research [22].

4.1 Design Science Research (DSR)

4.1.1. DSR

DSR focuses on the development of artifacts and provides guidelines for evaluation DSR progress followed in this study is presented below (see Figure 3).

As the first step of this study, the problem awareness arose through a user needs analysis, which was conducted based on the analysis of the data collected by KTH researchers in June 2018. Secondly, an SRL tool (as a part of step 2, i.e., suggestion) was developed with a focus on students’
interaction with physical activity at yellow sofas [25].

The results of the earlier performed work showed that second language students at SALC needed digital learning support that would assist them in the development of their SRL skills. The students were found to need digital tool that would provide: i) easy communication with learning advisors and peers, ii) track their learning progresses, and iii) a close connection to other interactive learning and teaching activities (e.g., to watch English TED talks together with peers and learning advisors) offered by SALC [10].

Besides, a specifically designed SALC app was developed in 2014 and used at SALC in 2015. Yet, that app was found to have limited usability, including a lack of communication between students and learning advisors and the functionality to save relevant documents by the students [10]. Overall, the results indicated a clear need for a new learning tool that would support students’ development of SRL. Figure 4 summarizes the time period and limitations of the tools used by SALC.

<table>
<thead>
<tr>
<th>Tools</th>
<th>Time period</th>
<th>Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SALC app</td>
<td>2014 - 2015</td>
<td>Lack of communication and the functionality to save relevant documents</td>
</tr>
<tr>
<td>Moxtra</td>
<td>2018 - until now</td>
<td>No learning data record functions and any no interactive functions connected to physical space at SALC</td>
</tr>
<tr>
<td>Prototype 1</td>
<td>2018-2018</td>
<td>No evaluation due to time limitations</td>
</tr>
</tbody>
</table>

**Figure 4:** Summary SALC used tools

Since students use mobile technology widely and it has been earlier found that mobile technology can be effectively used in educational settings and in particular, for students’ second language acquisition (10), [19]), the use of mobile technology to design and support second language students’ development of SRL in this particular situation was suggested as a possible solution. To meet the Japanese second language students’ needs, an initial prototype (prototype 1) of a digital platform (with a focus on the front end design) (Images 3 & 4 show parts of the prototype 1) aimed at supporting student development of SRL was developed in Autumn 2018 (for more see, [25]).

4.1.2. Research Ethics

Before the interviews, the study participants were informed about the purpose of this study and the research procedure. Written informed consent was obtained from all participants for their issues to be utilized for this work. Following the General Data Protection Regulation (GDPR), participants were given the choice to withdraw from the research study at any time during the study. The interview data was later anonymized.

4.2 Data Analysis Method

Thematic analysis is “way to identity the patterns of meaning (themes) across a data set” [20]. A theme is the most important data for answering the research question [21]. In this study, thematic analysis was used to analyze the interview data collected by semi-conducted interviews and find the common patterns for answering the research question.

5 Problem Awareness

The problem awareness step relates predominantly to the results of the work conducted by the researchers from KTH and KUIS in 2018, outside the scope of the current project. For the coherency of this thesis's presentation, the results of that work are presented here and not in the case description section (Section 3).
At that time, the prototype 1 design focusing on the affective learning part of SRL was only at its initial stage. In particular, in prototype 1, affective learning scenarios were used to only indicate students’ current mood before they start their learning activities (e.g., practice English with peers at yellow sofas) and after they finish their learning activities. Image 5 shows the screen for students to choose their current mood.

Image 3: Start Screen  Image 4: Chat Bar

Also, due to the time limitations of the conducted project work, there were no opportunities to further develop the affective learning scenarios. However, since the affective aspect of learning is a key part of SRL [16], in this thesis, I have chosen to focus on the further design and evaluation of chosen affective learning scenarios as a significant part of the ATLAS tool to be used to support second language learners’ in their development of SRL.

6 Suggestion – Supporting Student Affective Learning

To assist students in their development of affective learning strategies and skills, this study introduces several affective learning scenarios that have been integrated into the ATLAS app, i.e., a further developed version of the initial prototype (for more see section 7.1). The introduction of such scenarios will allow students, learning advisors, and also researchers to access, collect, and analyze learners’ SRL process-oriented data that can be used to measure and support students’ further development of self-regulation in their second language learning.

Another suggestion was to design ways of sharing students’ use of these scenarios, in particular, their continuous use of the emotions’ representations with learning advisors and their peers. A share of their affective learning data with their peers aims at allowing learners to preview the offered learning tasks and learning materials in the app.

This suggestion offers an opportunity for learning advisors to monitor students’ SRL behaviors and their affective feedback on the offered learning tasks in the app. However, considering the personal preferences, students would be able to choose whether they would like to share their use of the emotions or not and share with whom and at what time.

7 Development

In this section, first, we present a prototype of the ATLAS app developed within the frames of this project. Second, we introduce the design of the specific affective learning scenarios that have been designed and integrated into the app.

7.1 ATLAS app

Since SALC has been working with fostering students’ SRL for several years, the SRL focused the content of the learning scenarios included in the app was originally inspired by the content suggested in the two SRL modules offered by SALC. However, the original paper-based content of these modules did not include any components of the affective learning aspect of SRL. During the design progress, affective learning was introduced to the study. We then decided to use emotion icons as affective learning scenarios to facilitate student’s SRL development.

To meet the Japanese students’ cultural preferences, the graphical design of the offered learning scenarios was adapted from several Japanese selected cultural symbols, such as the Japanese architecture and natural scenery (see Images 6 & 7).
The present version of the ATLAS app consists of two main parts. The first one introduces a language learner to a number of learning scenarios focusing on how to be a good self-regulated learner (reflects the 1st SRL module), e.g., what learning strategies are or how to seek relevant learning materials. Due to the time limitation of this project, the ATLAS app only visualized the learning strategies practices (see Image 8).

Moreover, several affective learning scenarios have been integrated in the first part of the ATLAS app. In this part of the app, relevant scenarios were introduced in particular to assist students in their development of self-reflection skills and strategies (as a key part of SRL process, [2]). For example, students can choose their emotions as the last step of self-reflection (see Image 9). The other parts of the SRL process (i.e., planning and monitoring [2]) were not considered as the main aim of that part (related to the SALC module 1, for more see section 3). This part of the app just aimed at introducing key SRL strategies needed for successful acquisition of the target second language to learners.

The second part of ATLAS app (Image 10) - to be taken after student finished the first part - offered a possibility for a learner to plan, monitor and reflect on her/his own language learning process; in other words, to develop herself/himself as a better self-regulated learner. Here students have opportunities to go through all the three SRL phases by themselves [2]. The second part of the ATLAS app is a further development of the second SALC module that focuses on the application of SRL strategies for students’ second language studies.
Affective learning scenarios (with a specific focus on the use of emotions) were introduced to assist the students' whole SRL progress, i.e., planning, monitoring, and reflection. In detail, the ATLAS app offered students to choose their emotions after they complete relevant learning tasks connected to each SRL phase (see Images 11 a & b).

For a learning advisor, the emotional data derived from the students' use of affective learning scenarios in the app will be accessible. Such data can be used to understand students' attitudes towards the suggested learning tasks and materials in the app. For example, if a task of reading a book receives ten negative emotions, it will indicate that most students need help with that task, or the task does not meet the students' needs. Moreover, if a student shows negative emotions for a long time, learning advisors will have an opportunity to intervene in time.

### 7.2 Emotional Design

The graphic design of the eight emotions is based on Asian culture: the sunny doll (see Image 13). The sunny doll is widely used in Asia, as a prayer tool that hangs outside of the window during the rainy season; it is a tradition that means a wish of a sunny day. The emotion icons evaluated in this study are shown in Image 14.

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![Image 13: Sunny Doll](https://new.qq.com/omn/20190102/20190102A12K5F.html)
8 Evaluation
To understand students' perceived attitudes towards the designed affective learning scenarios in the ATLAS app, 13 face-to-face semi-structured interviews were conducted with students at SALC in June 2019. (See Appendix 1 for the interview guide)

8.1 Participants
Thirteen second language students participated in the interviews. The age of students varied between 18 to 26. 70% were women. The majority of students were Japanese who studied English as their second language; one student was from Taiwan and studied Japanese as a second language.

In this study, both convenience and randomized sample approaches were used. Ten respondents were selected by the learning advisors at SALC for participation in this study. These students had previously taken one or both of the SALC’s SRL modules. The remaining three participants were chosen by the author of this thesis: they have studied English as a second language but did not take part in any SRL module offered by the SALC.

8.2 Interviews
Each semi-structured interview lasted for 25 minutes and started with a short introduction to the study purpose. Each semi-structured interview was followed by demographic questions (e.g., How old are you? What is your nationality?). Then the main part of the interviews started.

Firstly, in order to evaluate the emotional design (Image 14), the images of the designed emotion icons (the icons shown in Image 14), without any explanation of what the icons mean in terms of their emotional representations, were shown on a researcher computer screen. Then the participants watched the images on the screen for 1-2 minutes per icon. Secondly, the participants answered questions such as How do they perceive the offered images? or What do they think about the emotional meaning of the images?

Thirdly, a paper-based version of affective learning scenarios with the originally implied meaning (i.e., what each icon stands for, such as anger or sadness) was shown to the participants to compare with their own initial perceptions of these images. They answered questions such as i) what images cause the most confusion? ii) what images are difficult for them to understand and why?

Further, the participants were asked to sketch the emotion icons by themselves in order to better understand students’ emotional perceptions through their drawings. Ideally, the results of this task will be used to improve the design of the emotion icons.

As the last steps of the interview, an introduction to the affective learning scenarios (integrated into the ATLAS app) to support their self-regulation was given. Participants shared their opinion about how they would like to use the affective learning scenarios in their SRL study practices. Students answered such questions as: i) Do you want to use affective learning scenarios to support the development of your SRL? ii) From your point of view, in what way/s can emotional learning scenarios support your SRL? iii) In what SRL phases (i.e., plan, monitor, reflect) should technology-assisted affective learning scenarios be integrated?

9 Results
9.1 Evaluation of the Emotional Design
9.1.1 Design of Emotion Icons
The results (Image 15) indicate that our initial design of the eight emotion icons (Image 14) caused some confusion among the study participants. This mainly related to the icons of trust and surprise. 66% of the participants perceived the trust icon as the icon which expresses ‘love’. Also, 60% of the respondents did not understand the meaning of the surprise icon, instead they thought the ‘surprise’ icon stands for happiness or motivation. 33% of the participants were confused about the meaning of anticipation, trust, and disgust icons. From their views, the fear icon means surprised or sad. They also thought that the anticipation icon means happy and the disgust icon means bored. Only one participant felt confused about the sadness icon. She (R1) stated that “the sadness icon means moody because the sadness icon has a raining logo above (the sunny doll)”. All the participants understood the meaning of the joy and anger icons.

Image 15: Results of Icon Evaluation. Vertical axis is the eight emotions. Horizontal axis is the number of students correctly identifying that emotion icon.

In order to evaluate the chosen emotion, the study also explored the most frequent emotional words that students use to illustrate their feelings associated with their daily learning experiences. The words they chose were slightly different from the eight human emotions words integrated into the ATLAS app. Happy, fun, excited, satisfied, comfortable, and motivated are the most frequent positive words they used. Worried, nervous, busy, and tired are the most frequent negative emotion they used. One of the respondents (R4), for example, claimed that “I don’t use trust in my study”.

All in all, based on the aforementioned results, there were some changes made for the design of emotion icons (see Image 16). First, the icons – fear, trust, and anticipation were deleted due to participants did not use them in their daily study practices and those three icons were hard to understand. Second, the weather logos above the sunny doll were removed. Last, when integrating the icons into the
expressed that "learning scenarios would increase their motivation to learn. Also, the participants emphasized that the use of the ATLAS app would help him to understand and visualize his negative emotions so that he can talk with his friends and/or learning advisors if he needs help.

In addition, the students (e.g., R6, R7, R8 & R13) also stressed that affective learning scenarios would increase their engagement in SRL and consequently enhance their learning experiences. R6 and R8, for example, underlined that affective learning scenarios would make their study experience more fun. According to R8, "emotions would make the app more interesting, make [her] study progress more fun. I would like to access this type of app many times". Similarly, R13 stated that "I know my feelings clearly through visualizing my feelings in an app. Understanding my feelings will help me study. I feel more motivated. I will enjoy using the app". R13 also pointed out the importance of visualizing the affective learning scenarios. This student stated: "I am not good at expressing my feelings. Some teacher asks me about my emotions, I think it is difficult to answer. But in the app, it will be easier to express my feelings. I just need to click the feeling, like the emotion icons".

Two students (R3 & R5) showed negative attitudes. R5 argued that it was hard for him to express his feelings because he did not think about his feelings during the study. Similarly, R3 stressed that "I would like to focus more on my study. When I am studying, I don’t feel any kind of feeling. I cannot think about two things at the same time".

9.3 SRL Phases and Affective Learning

Participants had three different ideas concerning at which SRL phase/s (i.e., planning, monitoring and reflection [2]) should the affective learning scenarios be integrated into. Five participants (R2, R6, R8, R10 & R11) stated that they would like to use affective learning scenarios after each phase as a simple reflection of their study. R11 stressed for example that "I prefer three times [after each phase], because my emotion is changing in each phase. For example, when I plan my studies, I feel anticipated, while when I study, I feel sad. And I would like to know. Knowing my feelings will help me control my mood".

Four participants (R3, R7, R9 & R12) expressed that they would like to employ affective learning scenarios when planning (i.e., SRL phase 1) and evaluating (i.e. SRL phase 3) their second language learning activities. By doing so, they would be able to compare their emotions before and after study. R9 stated that "I would like to use the emotions icons at the beginning (plan phase) and the end (reflection phase). I don’t need emotion at each phase. Because I want to compare my emotions".

The rest of the participants (R1, R4, R5, & R13) emphasized that it would be enough to only use affective learning scenarios at the last phase of SRL, i.e., when (self) reflecting on their performed language learning activities. R1 argued that "It would be overwhelming if the emotion is used after every phase, especially when I finish three phases within one day".
Also, R13 explained that it would be better to use affective learning in the end phase because she only wants to know the final emotion.

In summary, the majority of the participants stressed that they would like to use mobile technology supported affective learning scenarios in their SRL and second language learning.

### 10 Discussion and Conclusions

The aim of this study was to support second language students’ development of SRL by focusing on the design and perceived attitudes towards selected affective learning scenarios. Except for the designing of the ATLAS app as a response to the first research question, this study aimed at also answering the second question, i.e., What are the students’ perceived attitudes towards the designed technology-supported solution to assist their self-regulated learning?

#### 10.1 Re-designing the emotion icons

The results of this study show that three emotion icons (i.e., trust, anticipation and fear) needed to be either re-designed or removed (see Section 9.1.1). An alternative would be to introduce these specific icons earlier in the students’ learning process (e.g., in the first SALC module) so that they can learn to recognize them. However, to be able to further generalize these results a further evaluation with a larger sample of the study participants is needed.

#### 10.2 Increased Motivation and Awareness

The results indicate that the second language learners’ motivation for SRL and awareness of their SRL progress will be increased by using affective learning activities to facilitate self-regulated second language acquisition. The results fit in with previous research findings [6], which emphasize that second language learners benefit from affective learning.

Affective learning, as a key component of SRL, helps students to regulate their SRL progress [15]. By applying the affective learning scenarios, learners have an opportunity to understand how their emotional state changes during their study progress, which facilitates them to monitor their SRL learning progress by themselves. This is similar to previous research [7], which suggested that affective learning allows second language learners to manage their learning progress.

#### 10.3 Increased Communication

The results also stressed that affective learning scenarios promote communications between students with their peers, also students with their learning advisors. By using affective learning scenarios, both students and learning advisors notice students’ emotional changes. These changes not only offer an opportunity for learning advisors to intervene in time, but also to help students to understand their own feeling of different learning tasks.

#### 10.4 Design Implication

The results reveal that the majority of respondents show positive attitudes towards the use of affective learning activities in the ATLAS app. This would support their development of SRL. The students also show their different user preferences of using affective learning scenarios (see Section 7.3.3), which indicates that the tool needs to be personalized for each user to on the individual level to effectively meet her/his needs.

Based on the found results, several design implications should be considered to improve the usability of the tool. They include:

- To choose the emotional words based on users’ preferences
- To offer an option for choosing at what SRL phase the users want to use affective learning scenarios
- To allow notifications that would remind users to use affective learning scenarios

In the context of this study, in which we have only tested a non-interactive prototype with the users, the ethical issues were not critical. However, as some students were uncomfortable to share their emotional status with e.g., teachers, further development should carefully consider:

- To provide an option for the user to choose whether they would like to share their emotions or not
- To provide an option for the users to share what kind of emotional data they would like to share with for example, their peers and/or learning advisors

#### 10.5 Limitations and Future Research

This study has three main limitations: i) the data are generated by a limited user group, ii) there may be some language misunderstandings due to the fact that the respondents were not fluent in English, iii) the ATLAS app is a low-fi prototype and not a fully functional tool.

For more precise results, a future study should be carried out with a fully developed tool and involve more participants using the tool for a longer period. Also, user interviews should be ideally conducted in the learners’ first language. This would reduce potential miscommunication and create a better user test environment, i.e., it will be easier to for participants to understand the questionnaire and express their thoughts.

This study touched upon only some cultural characteristics (e.g., when developing emotional icons and the interface of the ATLAS app) for second language learners, but there was no extra time to evaluate the learners’ needs of culture preferences. As was mentioned earlier (see Section 2) the designers’ considerations regarding users’ culture preferences would create a better user experience. In particular, it is necessary to further explore whether culture preferences will facilitate second language learners to develop their SRL.

The results of this study contribute to the SRL research area, both as a field of research and practice. For the research area, this study emphasizes students’ perceived attitudes towards...
the introduction of affective learning scenarios to SRL development are positive. The perceived motivation and awareness of SRL will be increased. Affective learning as a key component of SRL facilitates students’ development of SRL effectively. This study also offers a practical example of the mobile tool to support language students’ development of SRL. The results also underline that it is necessary to develop relevant tools and use technology-supported affective learning to assist learner’s development of SRL skills, strategies, and knowledge in second language acquisition. From a practical perspective, this study also provides design guidelines that should be considered for designers to design related tools

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REFERENCES


Appendix I: Interview Questionnaire

Section 1

1. Age
2. Gender
3. Nationality
4. Have you taken SALC learning Modules? If yes, which modules have you taken?
5. How long have you taken SALC SRL modules?
6. Are you comfortable with using English?

Section 2

1. Please describe what is your first impression of the icon above? How do you perceive this icon? What is the meaning of the icon, according to you? Explain why!

Section 3

1. Which icon/s do you think is confusing? (multiple choices)
2. Would you like to include emotions in your own self-regulated learning or not?
3. Please explain why? And how would you like the emotions to be included in?
4. Which of the following words would you like to use for describing your feelings in your own self-regulated learning? Or have been used for describing your study? (Multiple Choice)
5. Do you think that the introduction of the emotion icons (or affective learning scenarios) in the ATLAS app would facilitate your learning?

6. Please explain why and how.

7. Do you think emotions should be introduced in every SRL phase (plan, do, reflection) of the ATLAS app or just in one phase? Why and how?

8. Would you like to share your emotional data with others? Such as your peers and learning advisors.