

# User Experience Considerations in Motivational Design for Sustainable Mobile Learning Usage

Jarmo Seppälä<sup>\*1,2</sup>, Takashi Mitsuishi<sup>\*1</sup>, Yuichi Ohkawa<sup>\*1</sup>,  
Xiumin Zhao<sup>\*1</sup>, Marko Nieminen<sup>\*2</sup>

<sup>\*1</sup> Tohoku University, <sup>\*2</sup> Aalto University

This study investigates how student feelings and emotions in a smartphone-based review material application can be used to develop motivating features for sustained m-learning use. Subject of the study is a smartphone application used in Chinese learning, “KoToToMo Plus”. In order to investigate these feelings and emotions, we use the Keller’s ARCS model of motivational design and appropriate User Experience (UX) design methods. The subject is approached through a practical design challenge, in which interactive UI prototypes are created and evaluated in iteration. These prototypes are used to measure the user experiences, in order to find out if there are unique design considerations relevant to the motivational design of m-learning applications. In addition, we demonstrate how UX research can be utilized in instructional design & Motivational Design Process.

Keywords: User Experience, User Interface, Motivational Design, ARCS

## 1. Introduction

Learning a foreign language requires a time, motivation and various learning methods. Reviewing and repetition play a key role in mastering a language; mere classroom education hours are not enough. Therefore, many institutes have proposed approaches that combine online educational materials with traditional classroom methods. Blended learning enables the usage of different forms and methods, such as mobile learning, in foreign language teaching settings, inside and outside formal tuition. Given the vast coverage of mobile devices, increasing number of students wish for learning materials to be distributed through their smartphones. However, only a handful of learning materials have been designed to facilitate this type of mobile learning. Currently, there are no clearly defined approaches for designing such materials for blended learning environments that considers user’s motivations, learning goals or user experiences while interacting with the UI. (2)

As a supplement to the face-to-face beginner level Chinese courses, a mobile application, KoToToMo Plus, has been used in a blended learning classroom to review the studied materials after the classroom lectures (1). The application allows students to practice four types of language learning; reading, speaking, listening and writing. The application makes use of microlearning, in which learning contents can be studied in small portions throughout the day, independent of time and place. The application has been in use since 2017 and is constantly being developed and updated to meet

student’s learning needs. Recently, KoToToMo’s user interface (UI) has been updated as KoToToMo Plus, in order to enable students to review the materials according to the class progress and to select learning content according to their recent status. (2) These functions are visualized in figure 1 below.

According to the questionnaire results, students found the new visualization functions useful, but increased learning time and amounts cannot be yet confirmed. Language learning is a type of skill learning; continuous and repetitive daily learning habit is preferable for attaining language mastery. Therefore, further investigation on methodologies that increases learning durations in addition to promoting intermittent learning is necessary. (3)



Fig. 1. Screenshots of the existing application

## 2. KoToToMo Plus

### 2.1 Current usage patterns and issues

Although KoToToMo Plus has been generally well received by the students, there are distinctive learning patterns and reoccurring student feedback that gives an indication of varying motivation levels.

With the recent updates in the UI, students are able to track their study progress within the app, but there is a lingering sense of uncertainty among the students about how much repetition is enough; how to know the maturity levels of the studied subjects? Students also tend to postpone their learning, although there are possibilities to study anytime and anywhere. Consequently, majority of the students study right before the bi-weekly quizzes, instead of regularly throughout the semester. Regular learning has been demonstrated to be a more effective way in retaining the information long after the course has ended, comparing to intense, last-minute studying before the exam (4). Some students have also expressed their discomfort in doing speaking and pronunciation practices in public spaces. This might affect the physical location and time, when student engage in this practice. (2)

### 2.2 Necessity of UX Research

In order to boost student motivations to do more regular learning, we need a more holistic view on how KoToToMo Plus is used.

Much of the UX research is about understanding user expectations, needs and behaviors through systematic and investigative approaches. In other words, the goal of a UX is to support in the process of understanding how people perform tasks and achieve goals that are important to them. By interacting with the actual users of KoToToMo Plus, we might get better sense of the impact of the application's design on future users, while omitting our own biases related to assumptions and expectations.

The essence of UX is focusing on actual user needs, for which the required features can be defined and prioritized. So far, qualitative means of data gathering has not been conducted with the students. We believe that investigating student feelings and emotions about using KoToToMo Plus could provide further insight on how the application is used in real life contexts. Thus, we believe that user experience (UX) design and research can be used to tackle these issues. (5)

We investigate the UX requirements for sustainable mobile language learning through these issues and propose a suitable UX model.

## 3. UX in Digital & Learning Systems

### 3.1 Perspectives and Elements of UX

Garret (2000) presents a 5-plane model for constructing user experience for Web UIs, but it's applicability can be extended in other types of interfaces and digital product design as well. The model shows the relation of the planes from abstract to more concrete. This can be seen in the figure 2 below.

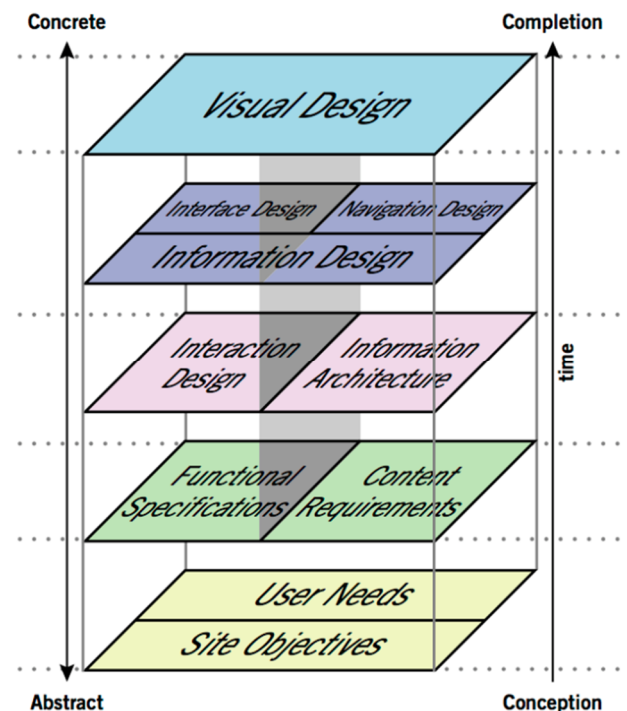


Fig 2: The Elements of User Experience

Left part of the model is task-oriented and considers the UX from a more functional, software interface-oriented viewpoint. Right part of the model is more information-oriented and describes the UX as a traditional hypertextual information space, as the Web originally used to be. (17)

Morville presents *UX honeycomb* model, which explains 7 different aspects, or “facets” of the user experience that a product or a service might have;

- **Useful:** product fulfills users' needs
- **Usable:** the product must be easy to use
- **Desirable:** image, identity, brand, etc. are used to evoke emotion and appreciation
- **Findable:** navigable sites & easily locatable items

- **Accessible:** product considers people with disabilities
- **Credible:** Users trust and believe the product

Morville explains three main usages for his model. First, it is a tool for communication. The facets can initially help the designer to identify and prioritize all the relevant areas to good user experience. For example, by asking questions such as “which of the facets are more important than the others, e.g. is it more important for the application or product to be accessible, than desirable?”

Second, the model brings a modular approach; each of the facets can be targeted individually in the design.

Lastly, the model can be used as a “glass window” for looking through and speculating what type of activities the users would do, per a facet. This can potentially transform how designers see what they are doing, enabling them to look beyond conventional boundaries. (18)

### 3.2 UX & Instructional Design overlap

UX research and instructional design disciplines share many similarities, but there seems to be a lack of communication between these two fields (6). This section discusses what UX considerations are important in learning environments.

Development of learning applications in mobile contexts has challenges in pedagogy, evolving technology, usability and UX design. The studies on how UX can work together with instructional design are scarce, but there are certain elements that have been demonstrated to be of great importance in distance learning platforms. In mobile learning environments, well-designed user interfaces with high usability have had a significant effect on student motivations (7), but according to Hassenzahl, there are “beyond instrumental” characteristics, in which user’s holistic goals and hedonic aspects also need to be fulfilled (8). These can be considered as non-functional requirements (e.g. feelings of engagement, enjoyment, accomplishment and emotional attachment), which seem to play a key role in supporting sustainable usage of an m-learning application (9). The importance of emotions that the user experiences when using an application have been demonstrated, but these factors have not yet been researched thoroughly (11).

According to Haag, instructional designers should consider establishing UX goals for their solutions in order for the learners to find them usable, engaging and motivating, along with satisfactory learning experiences (12). Examining UX in learning systems from both UI and instructional design perspectives is

possible, but there are different objectives for these two paradigms: UX supports immediate interaction and instructional design long-term learning gains. UX research typically focuses on the experiences of an individual learner, especially on aspects other than learning; these include playfulness, engagement, fun, or usability (1). As per Norman, “True user experience goes far beyond giving customers what they say they want or providing checklist features.” (10)

## 4. Related studies

### 4.1 Elevating student motivation via gamification

Pioneer in the field of gamification, Yu-Kai Chou, argues that even though many UX designers might craft easy-to-use UIs and effortless experiences, they do not explicitly focus on improving user’s intrinsic or extrinsic motivations. However, recent studies on increasing student motivations in distance learning platforms have not only utilized “traditional” UX considerations, but behavioral psychology and game design thinking. (15)

Thurston (2018) implemented an online programming course by using ARCS model for motivational design, combined with Hidi’s *four-phase model of interest development* as a framework for gamification implementation. To gain students initial attention towards distance learning, Travis states that gamification can be used to create situational interest, in order to allow the student to build interest and later become intrinsically motivated to learn. The students responded favorably to the incorporation of gamification in the course and the impact it had on the overall learning experience (14). However, the study focused on a browser-based e-learning application and does not discuss about UX considerations for motivating intrinsic, self-directed learning that is independent of time and place.

Despite of the industry-wide commotion around gamification, many studies share the consensus about the detrimental effects that some of “traditional” gamification elements, such as implementation of points, badges or achievements might have. Many gamification solutions fall short in the attempt for sustainable engagements (16).

In his framework, the *Octalysis*, Chou presents eight motivational drives that drives people to do activities. Some of the drives focusing more on extrinsic motivations, while some target more intrinsic motivations. These drives are meaning, empowerment, social influence, unpredictability, avoidance, scarcity, ownership and accomplishment. In order for gamification to be successful, Chou states that the drives need to be in balance (11). This means

that there should not only be features that draw from one or two of the drives.

Larsson (2015) used some of the core drives of the Octalysis framework in exploring how intrinsic motivation can be increased by utilizing gamification strategies in an e-Learning environment for programming. Larsson proposed his own framework, which consisted of five strategies: Meaning & Framing, Autonomy & Freedom of Choice, Mastery & Reflection, Social Connection & Relatedness and Context & User Situation. Larsson specifically targets intrinsic motivations, leaving out the “traditional” gamification methods. The Octalysis provides a properly structured overview of the different motivations, it is still rather abstract. Larsson also points out, that of the core descriptions are unclear and lack scientific consensus. (16)

When analyzing the beforementioned studies, it is apparent that gamification is a prevalent element in motivational design approaches, whether it is targeting extrinsic or intrinsic motivations.

#### 4.2 UX Frameworks for m-learning

Dirin et al. proposed a mLUX framework, which provides a user-centered process model for developing m-learning applications. In its core, the framework consists of three components; stakeholders, context of use and process. (11)

Practical methods in the development and design process make use scenarios and stories that embed user’s emotional and behavioral factors into the concept development phase. The framework considers UX related factors, such as delightfulness, reliability, satisfaction, and adjustability as key factors when designing for continuous usage in any m-learning application. Satisfaction and adjustability arise from the direction of usability, in contrast to delightfulness and reliability which relate to students’ emotions and feelings. Dirin et al. have used the framework in various case studies; one of them investigated sustainable usage in an m-learning based driving school application via students’ emotional engagement. (11)

They measured the UX through these four key factors, with each factor having their own respective goal descriptions. Evaluation criteria for these factors were measured through subjective and behavioral means. They referred this method as Emotional Evaluation Analysis (EEA). As an example, one of the goals for adjustability is that students are able to customize their UI’s to their preferences and have the choice in selecting communication format, like email or newgroup. Subjective measurement criteria then assess whether the students feel that they have control of the application. They emotionally express as

though the application is their own. Behavioral measurement criteria observe whether the learners are relaxed and do not express stress or feeling of being lost in the application. The measurements were conducted during the usability tests of the application. (11)

### 5. Proposal of UX research for KoToToMo & complementing ARCS

#### 5.1 UX design for mobile learning motivation

Given the microlearning context in KoToToMo Plus, we believe that capturing student attention becomes the utmost concern for the UX design in motivation. *Attention* is also one of the main components in the motivational design framework, ARCS, where it is defined as curiosity, attention grabbing, and senses-seeking. In other words, it could be considered as a component that targets user’s motivations through visual and perceptual cues in the UI. Although the Attention component discusses about the strategies on capturing student interests, stimulating an attitude of inquiry and maintaining the attention (13), it does not deeply discuss about complex process of building for the UX in a digital learning environment, or cover the UX facets that were presented in the previously mentioned honeycomb.

How to intrinsically motivate the students through immediate interaction to do spontaneous, unplanned microlearning? In other words, how can we motivate the students before they look and interact with the app itself?

The current situation on how KoToToMo Plus is used by the students provide an opportunity to apply UX principles and user-centered design to investigate and clarify student statements. Whereas the student data will provide the framing for the UX, the ARCS model & Motivational Design process provide systematic phases for developing motivational learning contents.

#### 5.2 Current work and assumptions

We aim to gather the consensus amongst the existing and related UX and gamification frameworks, for example from those of Dirin, Garret, Chou. We investigate how they might differ or relate to the ARCS model, in order to create a synthesized model that considers both instructional design and user experience principles.

With the current student survey & statistics and state-of-art analysis as a groundwork, we can propose initial assumptions for the current issues in KoToToMo Plus usage.

Regarding the concerns about doing repetitions, we suspect that the students might be lacking the *sense of accomplishment* and *satisfaction*, due to the absence of informational and educational feedback. This could be targeted with extrinsic rewards, like badges or points.

Procrastination might be an indication of *lack of intrinsic motivation*. Intrinsic reinforcement should encourage the student about the benefits of using the m-learning application regularly (13). The question revolves around on questions like “how to motivate the student to start?” As an example, the students could receive push notifications to do their daily learning, and the UI could have a visualization of how many consecutive days the student has studied.

The student feedback about in-game items might indicate real user needs around *fun and entertaining features*, but these should be further validated, for example through interviews and testing sessions with interactive prototypes. Once the relevant UX factors for KoToToMo Plus are verified, we could also measure the UX through similar metrics as in used in the EEA, by Dirit *et al.* (11)

## 6. Conclusions

By identifying and elaborating the relevant UX factors in KoToToMo Plus and assigning goals and evaluation metrics, we believe that student feelings and emotions can be harnessed in designing and developing new, intrinsically and extrinsically motivating features for sustainable m-learning use. Through conducting a systematic study, connected to both Motivational Design and UX principles, the general aim of this study is to produce set of guidelines and recommendations for similar studies.

KoToToMo Plus has limitations, which needs to be addressed in the research. First, the e-learning materials used in this research were developed for only Japanese students learning Chinese as a foreign language. Subject matter and cultural contexts might affect the results of the study. Second, the learning data was collected from elective Chinese courses. Mandatory or elective courses might affect students’ motivation and decision-making and might not represent an all-encompassing view on motivations in using KoToToMo Plus. Lastly, we must consider the relevant mobile affordances in smartphone contexts, as KoToToMo Plus is only used in students’ smartphones.

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