Design Principles for a Pedagogically-Sound Mobile-Enabled Language Learning System

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Abstract: This paper provides a brief overview of a longitudinal Design-Based Research study conducted with ESP students and practitioners at a Canadian college. The study resulted in two key outcomes, namely the Mobile-Enabled Language Learning Eco-System and corresponding design principles. The design guidelines presented in this paper focus on the pedagogical aspects of the mobile-enabled intervention viewed through an ecological lens. The purpose of this paper is to introduce practical guidelines for language teachers and instructional designers who seek to develop m-learning solutions.

Keywords: Mobile-Enabled Language Learning, design principles, DBR research

1. Introduction

This paper summarizes the key findings of an interdisciplinary study which investigated the design of a Mobile-Enabled Language Learning (MELL) solution. The MELL Eco-System (MELLES) which resulted from this Design-Based Research (DBR) study addressed the problem of inadequate aural skills acquisition for college ESP (English for Special Purposes) students. Drawing on previous studies (Palalas, 2009), the project looked into employing mobile technologies to expand ESP learning beyond the classroom.

The main purpose of the DBR study, thus, was to generate design principles for a valid MELL intervention addressing the development of listening skills amongst ESP adult students. The eighteen-month process of data collection and analysis resulted in a conceptual model and design principles for a MELL solution supporting flexible authentic ESP practice. Consequently, the MELLES system was designed, developed and tested through multiple iterations involving 163 students and ten experts from a variety of related fields. MELLES provided a framework and a prototype mobile solution for teaching and learning listening while integrating the other language skills. In addition, the study enhanced the understanding of the broader context of MELL. The role of the learning environment was also examined resulting in the Ecological Constructivist framework proposed as a learning theory appropriate for any MELL context (Hoven & Palalas, 2011).

This paper focuses on the key results of the final phase of the three-phase DBR study, namely the pedagogical design guidelines for generating an effective MELL system. These guidelines encapsulate the essential characteristics of MELLES (substantive emphasis) and the strategies needed to realize those features (procedural emphasis).

2. Background and Statement of Problem

Listening is a language skill which, next to speaking, was identified as the area requiring the most remediation amongst second language speakers at George Brown College in

Toronto, Canada (Palalas, 2009). Studies conducted at the college between 2007 and 2009 indicated that students needed flexible learning solutions to accommodate their busy schedules and provide additional language practice. Our learners appreciated the portability and convenience of mobile technologies, and the personalized learning across real-life language situations. Participants observed that interactive and engaging MELL activities were an effective approach to learning listening. Several researchers demonstrated that mobile technologies were deemed appropriate for language teaching and learning (Demouy & Kukulska-Hulme, 2010; Kukulska-Hulme & Shield, 2008).

It was thus necessary to investigate what kinds of MELL activities would promote aural skills acquisition and to determine the technical and pedagogical requirements of such educational intervention. A systematic process was needed to design, develop and test appropriate MELL instruction including a prototype system as an instantiation of the theory. No guidelines or standards were available for creating this type of mobile-technology-based educational intervention. Hence, the three-phase DBR research study aimed at the outcomes described in the following section.

3. Research Question and Outcomes

The study was guided by the main question which inquired into the salient characteristics of an effective MELL solution. Auxiliary questions were also generated at various stages of the study congruent with the research activities and feedback gathered at each phase.

3.1 Overarching Research Question

The research question driving the DBR study was derived from an investigation of the problem depicted in the previous section and related literature. The question inquired: What are the characteristics of an effective, pedagogically-sound MELLES for students' mobile devices, through which adult ESP students in a community college enhance listening skills, while expanding their learning outside of the classroom?

3.2 MELLES Intervention and Design Principles

The DBR research, guided by the overarching question, produced two key outcomes – a MELL intervention prototype and design principles (intervention theory). The study aimed to develop a practical, innovative, m-learning intervention to teach listening skills to adult ESP students. Based on participant feedback the MELLES solution was generated to support flexible language practice situated in the real-world language speaking context, including the streets and landmarks of Toronto. The MELLES tasks combined individual focused practice with group activities contextualized in dynamic communicative situations challenging learners to converse with native speakers. Several consecutive versions of stand-alone mobile applications and individual mobile-enabled listening tasks were produced before a more systemic framework resulted in integrating these tasks into a complete solution - the MELLES system. Its portal, namely the mobi-english.mobi website, was used for tests and summative evaluation of the MELLES design guidelines. The many cycles of the solution redesign coupled with the evolution of thinking resulted in a design framework guided by Ecological Constructivism (Hoven & Palalas, 2011). The conceptualization and development of the successive prototypes were driven by the DBR feedback and design guidelines emerging progressively from each cycle. Ultimately, these principles evolved into what the pilots demonstrated to be pedagogically useful guidelines.

4. Methodology

Consistent with the ecological lens applied to the study, the DBR approach provided a broader and more systemic methodology for the design and research processes completed in-situ. It also accommodated the evolution of design constructs and conceptual thinking. Moreover, this interventionist approach allowed for experts in the field of mobile learning, software design, wireless technologies and language learning to collaborate and contribute their input. Both students and practitioners worked together to generate a solution to an educational problem they had been experiencing at the college.

This study stretched from June 2010 to December 2011 encompassing three phases: Informed Exploration, Enactment, and Evaluation (Bannan, 2009). Informed Exploration included literature review, audience characterization, investigation of comparable design solutions, and qualitative data collection via interviews with experts and language teachers as well as student focus groups and a mobile device usage survey (n=191). Mixed data was collected from students (n=21) and practitioners (n=7) from the Schools of Business, Design, and Technology as well as Communications/ESL. The first phase produced a theoretical *ideal* to guide the design experiment.

The two main outcomes of the Enactment phase were the prototype and the redefined design principles. During this phase, prototype MELL conceptual models were proposed by the Design and Technology students. Subsequently, the constant evaluation of the numerous design ideas combined with the new ecological paradigm led to a more holistic solution, namely, a functional MELLES prototype: a mobile web-based system. MELLES was designed, developed and tested by the researcher in collaboration with students and practitioners. In total, the Enactment phase feedback was collected from 41 students and six experts. Mixed data were gathered through assignments, designer logs, focus groups, meetings and correspondence, as well as researcher observations and reflections.

Evaluation encompassed implementation, testing, evaluation, and the refinement of the MELLES design. It involved testing of MELLES by L2 students and their professors in a real-life setting in Toronto. Five groups of intermediate-level ESP students completed eight listening tasks using their mobile phones. Feedback was collected from 109 respondents through successive surveys, interviews, focus groups and communication via the Wiggio site. The multiple cycles of coding resulted in recurring themes which indicated the design features considered by participants as crucial for the desired MELL intervention. These themes were organized into two super-categories: Pedagogy and Technology. They were then validated by the quantitative data. The ensuing findings were encapsulated into the final design principles examples of which are presented below.

5. Findings: Design Principles

A set of interconnected design principles was extracted from the research findings and analysis. The ten *pedagogical* essential characteristics distilled from the feedback include:

1) Balanced combination of individual and collaborative (group work) tasks;
2) Learner-generated linguistic artefacts (audio, video, photos, images);
3) Game-like real-life communicative tasks;
4) Expert facilitation: scaffolding, feedback, and coordination;
5) Feedback mechanism (immediate and delayed);
6) Focus on authentic listening tasks in dynamic real-world communicative situations;
7) Support of self-paced individual audio tasks feeding into/preparing learners for the real-life tasks;
8) Integrate all four language skills but focus on listening outcomes;

9) Linguistic resources (task-related): relevant vocabulary, dictionaries, pronunciation, clear task directions and explanations, examples of language usage;
10) Support of out-of-class learning with in-class (f2f) instruction and practice (a blend of in-class and out-of-class context).

These key features of an effective MELL solution need to be supported by corresponding procedural strategies. Examples (10 of 72) of substantive and procedural guidelines are mapped out in Table 1 to demonstrate their relationships.

Table 1. Examples of pedagogical MELLES design principles (substantive-procedural map)

Strategy (*Procedural Emphasis*)	**Essential Characteristic (*Substantive Emphasis*)**
1) Ensure communication and interaction with others in-person and via mobile-enabled channels	1) 1, 4
2) Include discourse with diverse interlocutors including L1 speakers	2) 1, 3, 5, 6
3) Incorporate language problems requiring negotiation of solutions	3) 1
4) Inject fun, enjoyment and challenge	4) 1, 3
5) Ensure dynamic meaning-making and negotiation	5) 1
6) Maintain regularity of group/class activities	6) 1
7) Build individual tasks to feed into the group tasks	7) 1
8) Include audio recordings (video, images, photos) created by students in response to communicative tasks	8) 2
9) Share and showcase learner-generated linguistic artefacts	9) 2
10) Provide tools for recording, editing, upload and viewing/listening on-the- go (or demonstrate device built-in tools)	10) 2, 6, 7, 10

6. Discussion

A MELL system developed following the above design principles, allows for the development of new knowledge and language skills based on the interactions among content, pedagogical procedures, mobile technology, learners and experts, as well as the context of learning. Consistent with Ecological Constructivism, MELLES relies on collaboration in the real-world context which mediates communication and, thus, language learning. While the real-life language situations create communicative challenges, the linguistic affordances offered by the environment provide support for meaning-making which, in turn, stimulates and generates language acquisition. In addition, the MELLES network of peers, experts and authentic language speakers facilitates learning by way of authentic discourse, feedback, resource sharing and social support.

Mobile devices are the tool which enables such communicative exchanges and the interaction over the MELLES web. They also help point to contextual affordances and capture linguistic evidence by way of learner-generated artefacts (Hoven & Palalas, 2011). Accordingly, learning supports come from MELLES resources accessed via the device. Mobile technology is thereby the enabler and one of the interconnected components of the MELLES learning network (Figure 1).

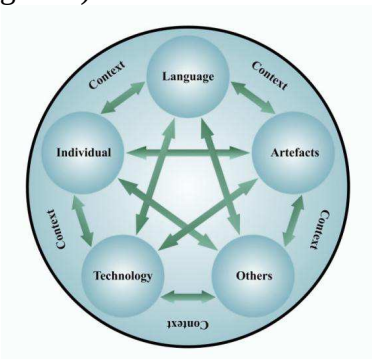

Figure 2. Interconnected elements of the MELLES learning context

All in all, MELLES enables practice of listening as part of a *whole* language experience that integrates all four language skills in a *whole* context of real-world communication out and in the class. While students complete eight integrated-skills tasks, regular in-class instruction should be combined with the out-of-class practice and linked into a cohesive learning experience by way of the MELLES platform and its tools. Furthermore, offering on-demand links to the system promotes social, cognitive, teaching, and emotional presence (Swan et al., 2008). This results in a collaborative network which has become the predominant structure of the recommended intervention. Adult learners engaged in meeting the demands of everyday life, need the support of a learning community to provide help and motivation. Considering how significant the notion of motivation was to participants, MELLES encourages continuity of practice through its emphasis on collaboration and communication as well as the design of its interlinked learning modules. MELL modules integrate time- and place-flexible individual listening tasks with collaborative game-like tasks completed in the dynamic language setting. These situated group tasks occur regularly throughout the semester to provide face-to-face peer interaction and motivate learner engagement. Finally, continuity of practice is also encouraged by means of feedback and expert facilitation which are offered in-person and digitally through the MELLES portal. All study participants, based on their perceived learning and positive learning experience, considered MELLES to be an effective approach to learning listening skills.

7. Conclusion

This eighteen-month-long DBR study incorporated voices of learners and practitioners resulting in two major outcomes, specifically (1) replicable MELLES design principles and (2) a prototype of a learner-centred MELL system that facilitates acquisition of language skills. Other key outcomes of the study included (3) an enhanced understanding of the broader context of learning ESP using mobile devices and (4) the role of the constituent elements of the learning environment. In addition, the study contributed the real-life praxis of (5) the Ecological Constructivist framework and the (6) DBR methodology which suited the dynamic character of the intervention under study. Future research is recommended to optimize the MELLES functionality and sustainability, as well as its applicability in other learning contexts.

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