

Vocabulary learning by mobile-assisted authentic content creation and social meaning-making: two case studies

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Abstract

In recent years, we have witnessed the concomitant rise of communicative and contextualized approaches as well as the paradigmatic development of the mobile-assisted language learning (MALL) framework in analysing language learning. The focus of MALL research has gradually shifted from content-based (delivery of learning content through mobile devices) to design-oriented (authentic and/or social mobile learning activities) study. In this paper, we present two novel case studies of MALL that emphasize learner-created content. In learning English prepositions and Chinese idioms, respectively, the primary school students used the mobile devices assigned to them on a one-to-one basis to take photos in real-life contexts so as to construct sentences with the newly acquired prepositions or idioms. Subsequently, the learners were voraciously engaged in classroom or online discussion of their semantic constructions, thereby enhancing their understanding of the proper usage of the prepositions or idioms. This work shows the potential of transforming language learning into an authentic seamless learning experience.

Keywords

authentic learning, learner-created content, mobile-assisted language learning, seamless learning, vocabulary learning.

Introduction

In recent decades, we have witnessed a gradual shift of the trends of language learning theories from behaviourist to communicative, contextualized and constructivist approaches (Chuo 2004). Developments in computer-assisted language learning (CALL) parallel these shifts. While the behaviourists focused on vocabulary acquisition and grammar drilling, those embracing the communicative use of technology stressed the use of language in simulations and text reconstruction (Warschauer & Healey 1998).

With the burgeoning interest in encompassing authentic learning and mobile-assisted language learn-

ing (MALL) paradigm into the sphere of language learning (e.g. Goodman & Goodman 1990; Hobbs 2001), it is anticipated that the inter-meshing of CALL and mobile learning can become a viable solution to blend learners' learning environment into their real-life contexts. The ready-to-hand access of mobile devices, which could function as a personal 'learning hub' (Wong *et al.* 2010), creates the potential for a new wave of evolution of technology-enhanced learning, characterized by 'seamless learning spaces' (Chan *et al.* 2006, p. 3). Such spaces are marked by continuity of the learning experience across different environments. Each learner, who has ubiquitous access to at least one mobile device (1:1), would have aplenty opportunities to learn across formal and informal contexts as well as individual and social learning spaces. By facilitating seamless switching between varied learning scenarios, it is

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envisaged that these interventions will influence the nature, processes and outcomes of learning (Chan *et al.* 2006).

This paper reports on two case studies of MALL conducted in Nan Chiau Primary School in Singapore. The first study was a one-off mobile-assisted classroom-based English lesson for a Primary 2 class. The lesson serves to reinforce students' understanding and application of six selected prepositions as delineated in the syllabus. During the lesson, the students were assigned PocketPC's on a one-to-one basis. The portability of the handhelds was exploited in one of the learning activities in which students were asked to venture out of the class to take photos in the school compound that best demonstrate the usage of the individual preposition.

Inspired and informed by the successful implementation of the first study, we conducted a follow-up activity entitled 'Move, Idioms!' This is a pilot study that incorporates seamless learning design principles into a Primary 5 class activity to help students acquire 29 common Chinese idioms. The students were assigned smartphones and had access to them anywhere and anytime throughout the 2-month period of the study. They were encouraged to become photo-bloggers by using their devices to take photos in their daily lives and make sentences with the idioms. They then posted these entries to a wiki space for peer sharing and reviewing.

Both MALL designs are very similar as they emphasize students' ability to associate the use of language to real-life contexts. In addition, both studies have delved into the contextual use of vocabularies but the major difference is that the learning process in the first study is confined within the walls of a classroom; whereas, the latter transcends physical boundaries to embrace emergent learning experiences that are taking place in students' daily lives. Such variance translates the learning process into an ongoing, open-ended meaning-making endeavor. The observed learning processes and the analysis of students' artefacts suggest a compelling direction for the focal point of MALL, namely, seamless language learning.

Literature review

One of the critical problems in traditional schooling practices is the excessive amount of decontextualized information, indirect and abstract knowledge, and second-hand experiences confined in classroom con-

texts (Barab 2002). Similar criticisms that relate to such pervasive language instruction could be found in the literature (Tedick & Walker 1995). Cullen (1994) notes that such instructions are often fragmented, and tend to be teacher-centered and separated from the students' needs and interests. This triggered language learning theorists to advocate language learning in authentic contexts (e.g. Widdowson 1978; Mishan 2005).

There is significant potential in the portability and versatility of mobile devices in promoting a pedagogical shift from didactic teacher-centred to participatory student-centred learning (Facer *et al.* 2004). Recent developments of MALL demonstrate a similar tendency. According to a survey by Kukulska-Hulme and Shield (2007), prior studies in MALL could be divided into two broad categories: content-based (essentially developing digital learning materials for mobile access) and design-oriented (essentially out-of-class, often authentic and/or social mobile learning activities). Studies related to content development usually focus on more formal contexts, i.e. pushing or pulling of relatively structured, often decontextualized, learning materials, that are related to language learning courses.

Those that are concerned with design-oriented issues tend to refer to the 'informal' nature of mobile learning. Much of such research or practice conforms to the communicative approach to language learning, where mobile devices may function as:

- A data collection tool (e.g. Kukulska-Hulme 2005; Petersen & Divitini 2005; Cavus & Ibrahim 2009) for recording learner-conducted interviews or casual interactions with others in the target language which could be used for future reflections, content creation and sharing.
- A communication tool (e.g. Kiernan & Aizawa 2004; Kong 2009) for learners to communicate with their peers, instructors or native speakers via phone calls, SMS or phone e-mail in the target language.
- A language assistant (e.g. Ogata & Yano 2004; Markiewicz 2006; Anderson *et al.* 2008) that provides instructions or references to support language learners in conversing with native speakers in real-life situations. Fallahkhair *et al.* (2007) offered another form of language assistant, the TAMALLE system, to provide just-in-time comprehension support on both the mobile and interactive television (iTV) platforms

to British iTV viewers who are non-native English speakers.

- A productive tool (e.g. Joseph *et al.* 2005; Hasegawa *et al.* 2008; Chen *et al.* 2009) for learners to generate small-scale artefacts such as short write-ups, photos or animations, perhaps *in situ* (i.e. related to the contexts that the learners were situated in).
- A tool for learners to interact with augmented realities (e.g. Ogata *et al.* 2004; Liu 2006; Chen *et al.* 2009), i.e. to detect the radio frequency identification RFID- or 2D barcode-tagged objects in their surroundings (or, in teacher-facilitated field trip settings) for further situated language learning.

In the context of vocabulary learning, most of the relevant MALL studies (e.g. Thornton & Houser 2002; Levy & Kennedy 2005; Chen *et al.* 2009) and commercial services conformed to content-based research. Such systems work in the way of pushing of relatively static vocabulary learning materials or quizzes to the device. In addition, a handful of studies (e.g. Song & Fox 2008; Jian *et al.* 2009) focus on the observational or ethnographic studies of the learners' informal or incidental language learning through mobile-based e-dictionaries as handy language reference tools. These are categorized as content-based research as they do not involve learning activity design. Ogata *et al.* (2004) design moves one big step by incorporating context-aware technology into vocabulary learning, as their system enables the learners to use their mobile devices to detect the RFID-tagged objects to retrieve (among others) their names (vocabulary), sound clips and explanations.

With respect to language learning theories, we argue that these vocabulary learning designs could be attributed to behaviourist learning despite having the additional advantages of self-paced-ness and, for content-based studies, anytime, anywhere learning. Furthermore, such designs are more suitable for the learning of 'context-free words/vocabulary'. Context-free words, such as nouns, are those which can stand by themselves without depending on sentence contexts (Elliot & Zhang 1998). Vocabulary which does not fall into this category could either be 'context-dependent vocabulary', such as prepositions, which are not rich in meaning and are better learned in sentence or phrasal contexts. The meaning of the latter depends on the presence of other words (*ibid.*), or certain types of compound vocabulary, such as idioms, proverbs and

phrasal verbs. Thus, there are many possible real-life contexts where each vocabulary could suitably (or unsuitably but often mistakenly) be used, but it is almost impossible for it to be summarized or prescribed in a simple definition.

Another recent MALL development is a shift in the interest to learner created content in authentic environments. Three such examples are reported by Joseph *et al.* (2005), Hasegawa *et al.* (2008), and Pemberton *et al.* (2009). The first two studies empowered the learners to create and contribute vocabulary learning content in the forms of vocabulary-captioned photos or videos taken with their handhelds in their daily life to illustrate individual words that they have learned. The third study went beyond vocabulary learning by developing Cloud-Bank, a system that enables international students in the UK to collect (in various media forms), annotate and tag intriguing language- and culture-related content found in everyday life to be shared and discussed in an online community. We will revisit these studies in the 'Discussion' section.

In this regard, we are keen to tap on alternative vocabulary learning approaches to address the issue. In his influential book, Nation (2001) proposes three psychological processes for successful vocabulary learning: noticing (a word is highlighted as being salient text input), retrieving (repeat encountering of the word) and creative/generative (a previously encountered word is met or used in a slightly different way or context). The three-stage model stresses the importance of the coupling of language input and output, and of the learners' creative/generative usage of the learnt vocabulary in alternative contexts. Could mobile technology facilitate or enhance such a learning process? How do we design innovative learning activities or learning environments that are informed by such a learning process and is targeted towards achieving the eventual goal of seamless language learning?

Case study #1: a lesson on six English prepositions

This one-off trial lesson was our early exploratory experiment under the bigger context of a 2-year school-based design research study (Brown 1992; Collins 1992) on 'leveraging mobile technology for sustainable seamless learning', code-named as the 'SEAMLESS Project' (Looi *et al.* 2009a). One of the key success factors of the endeavor was to implement a new

curriculum model and lesson strategies that gradually transformed the students' belief in learning from being passive knowledge receivers within the formal lessons to active knowledge builders and social learners who are keen to learn anytime, anywhere, and capable of synthesizing whatever they have learnt in both formal and informal settings. Thus, we conducted this trial lesson to investigate the possibility and challenges of developing such an innovative pedagogy.

Subjects

A class of 40 Primary 2 (8 year old) students participated in the trial lesson which took place sometime in September 2008. In Singapore, English is the language of instruction in schools.

Lesson design

Our main objective in conducting this exploratory experiment was to test the concept of designing and enacting a 'mobilised lesson' (Looi *et al.* 2009b). By 'mobilised lesson', we mean a lesson that starts with an existing lesson but then is transformed to make use of the mobile technologies to enhance the student learning.

The adopted mobile device was the HP RX3715 running MS Windows Mobile™ 2003 and with features such as a digital camera, Wi-Fi access, internet browser and text input (by both physical and virtual keyboards). The mobile-assisted lesson for the class was an English lesson on the topic of prepositions that lasted 2 h. The learning outcomes were for the students to be able to use six prepositions that the teacher covered before, namely, in, on, over, under, in front and behind; and to form sentences using the prepositions appropriately. The participating teacher led the lesson design with the researchers' guidance and support. The lesson consisted of the following activities:

- 1 The teacher helped the students to recap six prepositions with presentation slides.
- 2 Groups of three students left the class to take photos within the campus using their handheld to illustrate the six prepositions. They then made sentences on a worksheet to describe the photos.
- 3 Upon returning to the classroom, each student group shared their photos and the associated prepositions.
- 4 Each student was given a worksheet (a half-completed story 'template') on MS Word™. They were asked to fill in the blanks, with all the six prepositions being used, and to illustrate the story on the handheld with an easy mobile animation tool called Sketchy™.
- 5 Selected students connected their handhelds to the projector to share their worksheets (the completed stories) and Sketchy™ illustrations with the class.

The lesson ended with consolidation and evaluation of the results of the students' experiences when they were back in the classroom. In this paper, we focus on activity 2 of the lesson as this is the only part in the lesson flow that is relevant to Case Study #2. For an in-depth analysis of the full lesson, please refer to Looi *et al.* (2009b).

Findings: Students' photo-taking and sentence-making activity

During activity 2, the students carried out the photo taking tasks with great excitement. The mobility of the PocketPC's allowed the students to engage with the surrounding environment, and to take photos to record manifestations of the spatial relationship to illustrate their created sentence which used a certain preposition. Fig 1 shows some snapshots of the students taking photos of each other in action.

Figure 2 depicts some of the student artefacts produced during the lesson. When students took photos of arrangements that illustrated each preposition, they were expected to capture naturally occurring arrangements (e.g. Fig 2a and b). However, when students found that objects in their zone of the environment did not readily represent the six prepositions, they enacted the arrangements by using their body postures (e.g. Fig 2c and d). This coupling of physical actions and cognitive activities created opportunities for learners to engage in meaning-making processes from their own experience and engagement (Lai *et al.* 2007). We attribute such a learning strategy as improvisation. Improvisation allows students to use their imagination to push beyond conventional wisdom to discover new worlds of ideas and experiences (Polsky 1989). Collaborative dialogues played an important role in the student improvisation. Their communicative gestures and acting out were not planned or directed, but rather emerged from the interaction of the group with the context (Sawyer 2000). Through this engaging activity, students reflected upon the proper contexts in which each preposition could be used.



Fig 1 Students ‘acting’ out the prepositions.

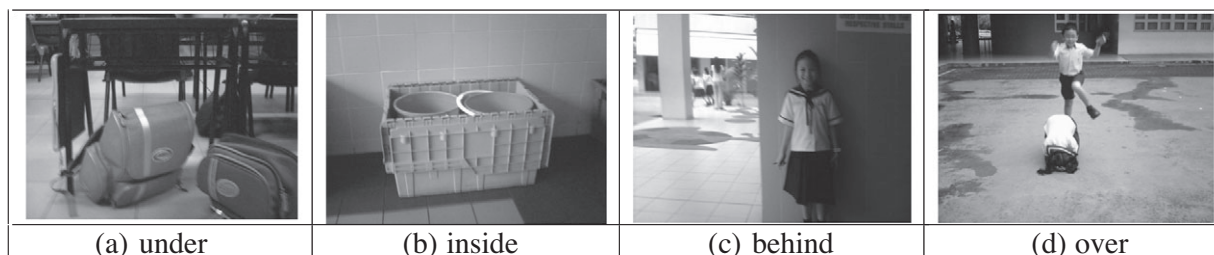


Fig 2 Examples of student artefacts created during case study #1.

Findings: voices from the teachers and students

Our post-interviews showed that the teacher and four students felt very positive about the lesson. The four students reported that they like the use of the PocketPCs because of its size and weight. The physical affordance of the PocketPC enabled them to move around easily in different physical spaces in the school while using the devices. The small screen size of the PocketPCs did not matter to them. About the activity, they preferred to work in groups rather than alone as they were able to seek help from their friends. The students said that they like sharing and showing classmates their work during class such as the photographs and Sketchy animations. Though the overall lesson spanned over two hours, the interviewed students did not feel that it was too long.

The teacher argued that the photo-taking/sentence-making activity and the storytelling/animation activity helped the students ‘to internalize and enhance the ability to apply the prepositions.’ The overall impact, as the teacher had observed, was that the students ‘are good at using the prepositions now; they can use them in

real-life like when they converse with me; they emphasize the use of the prepositions.’

Case study #2: ‘Move, Idioms!’ – Chinese idiom learning environment

Whereas the students seemed to be at home in handling digital devices, seamless learning is an abstract, and perhaps, a not-so-appealing, concept to them. Therefore, the ‘six-preposition lesson’ was not only intended for the reinforcement of the subject matter knowledge but also for giving the students the first ‘taste’ of using their mobile devices for student-centred learning in a contextualized setting. Such a design could be characterized as scaffolded seamless learning design because the teacher provided instruction and support.

Informed by Case Study #1, we initiated another one-and-a-half-year study which is not part of the ‘SEAMLESS Project’ but more a conceptual ‘spin-off’ research. The project, ‘Move, Idioms!’, consists of a pilot study which took place during July – September

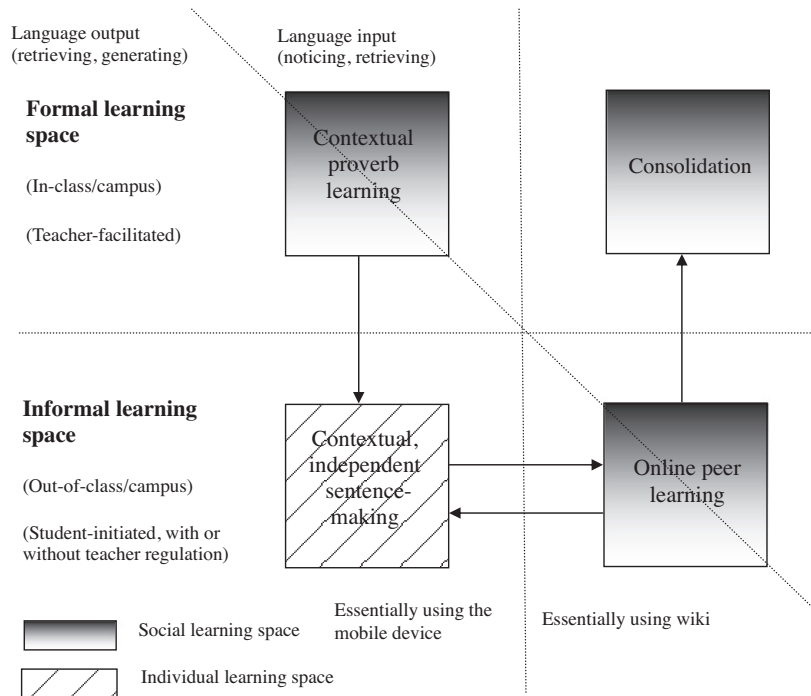


Fig 3 The mobile-assisted idiom learning process.

2009, and a full-scale design-based research, which will take place during January – October 2010. The new learning design essentially extends the lesson strategies of activity 2 in Case Study #1 from one-off to ongoing, i.e. students would use the handhelds to take photos, make sentences in their daily lives during the periods of study, share their artefacts as well as carry out asynchronous peer reviews on wiki.

Subjects

A class of 40 Primary 5 (11-year-old) students participated in the pilot study. They were Chinese Singaporeans, except for one Indian Singaporean. Some of them come from English-speaking homes, and their proficiencies of the Chinese language vary quite diversely.

Learning environment design for the pilot study

In facilitating the pilot study, we designed a customizable learning process to engage students in ongoing Chinese idiom learning and writing (sentence-making) activities. Each of them was assigned a HTC TyTN II smartphone manufactured by HTC Corporation of Taiwan and running MS Windows Mobile™ 6 and with functions such as built-in digital camera, Wi-Fi access, internet browser and English/Chinese text input (via both physical and virtual keyboards). Furthermore, we

used a commercial web service PBWorks (<http://www.pbworks.com/>) to create the wiki space for photo/sentence sharing and peer reviews. Apart from standard wiki features such as multi-user content editor and versioning control (page history), an online forum-style comment tool is also incorporated into each wiki page created in a PBWorks-based wiki space.

Figure 3 depicts the activity process of our learning design.

Each of the four-activity processes is briefly described as below: Activity 1 – In-class contextual idiom learning: The classroom/in-campus activities, which are co-designed by the participating teacher and the researchers in the form of lesson plans, are conducted with the aim of effectively carrying out the ‘noticing’ and ‘retrieving’ processes in Nation’s (2001) framework as well as motivating and preparing students to engage in subsequent out-of-school activities – independent sentence making (‘generating’) and online peer learning (back to ‘retrieving’). During each lesson, a new set of (typically six) mobile-optimized comical animations which depict the meanings of individual idioms is presented to the class as well as made accessible by the students for repeated viewings after school. The animations are sponsored by our research partner, a digital content developer based in Taiwan. The teacher shall

then conduct contextualized learning activities such as providing contexts, perhaps in the form of context-rich images, and challenging students to discuss relevant idioms, or motivating the students to take photos in the school compound to depict the idioms (similar to Activity 2 in Case Study #1) and then upload them to the Web.

Activity 2 – Out-of-class, contextual, independent sentence making: students carry the smartphones 24/7. Apart from repeated viewing of the animations, students are encouraged to proactively identify or create contexts in their daily lives which could be associated with any idiom they have learnt, take photos, make sentences that contain the idioms to describe the photos, and post them onto a class wiki space. The wiki space is organized to have one wiki page for each idiom covered in the class. Students will post their photos/sentences on the corresponding ‘idiom page’. This provides the affordance for students to easily compare student-identified contexts and their sentences pertaining to the same idioms.

Activity 3 – Out-of-class, online peer learning: Students are encouraged to perform peer reviews on the wiki by commenting on (with the PBWorks comment tool), or correcting or improving their peers’ sentences (by making direct modifications on the sentences posted on the wiki pages with a different font color). Due to certain technical constraints, they carry out these activities with PC’s or laptops, not the handhelds.

Activity 4 – In-class consolidation: Possible activities include class or small group discussions on selected sentences made by the students, or polls for ‘the most popular photo/sentence’ on each ‘idiom page’.

Enactment of the learning design

During the 9-week period of the pilot study, the teacher conducted five ‘idiom classes’ (Activity 1) in the first 5 weeks. In the first three classes, the students were required to ‘act out’ some of the idioms such as ‘火冒三丈’ (to see the with anger) and ‘七嘴八舌’ (to talk rapidly and incessantly) for peers to take photos within the classroom. In the last two classes, the students roamed around the school compound to capture images for illustrating idioms such as ‘五颜六色’ (colorful) and ‘一望无际’ (a boundless stretch). In between, the students were encouraged to carry out Activities 2 and 3. The teacher then facilitated Activity 4 in the seventh week. Students worked in groups of five, with each group being assigned an ‘idiom page’ to discuss and identify erroneous uses of idioms with respect to the contexts in

the photos or the sentences made, and to provide recommendations in correcting or improving the sentences. The students returned the smartphones to the school upon the completion of the study.

Findings: students’ learning activities and artefacts

Within the 9-week period, the 40 students contributed a total of 481 photo/sentence sets, revised (corrected or modified) sentences for 124 times, and posted 134 comments. However, the variation in the statistics of individual students’ contributions was huge (mean = 12.0, SD = 25.9), as the top contributor posted 151 photo/sentence sets (or 37.4% of the entire class’ postings) in total while 70.0% of her peers contributed less than 1 photo/sentence set per week in average. On the other hand, the students’ participation levels were more consistent in offering sentence revisions (mean = 3.1, SD = 7.3) and comments (mean = 4.5, SD = 3.4).

Our observation and our interviews with the teacher and the students helped us in identifying the challenges that had caused the uneven levels of participation among the students:

- Engagement levels: Many students showed great interest and engagement during the in-class Activity 1 but when it came to the after-school informal setting, they treated the smartphone as a new toy rather than as a learning tool.
- Technical issues: Some students often encountered, and were frustrated by, the technical problems in posting photos and sentences to the web via their handhelds.
- Parental attitudes: Out of fears of losing or damaging the smartphones, most parents forbade the students from bringing the devices out of their homes except for bringing them to the school, thus defeating the purpose of seamless learning and severely narrowing the contexts that the students could associate the learnt idioms with. Indeed, more than 80% of the contributed photos taken out of the campus took place within individual students’ home.

Despite these challenges, the student artefacts and their performances during Activity 4 (in-class consolidation) showed great potential and promise. One of the major additional elements in the ‘Move, Idioms!’ design as compared with Case Study #1 is the facilitation of synthesis and consolidation of various student-

identified contexts of the same idioms posted to the same wiki page. We argue that when a student visits or posts a photo/sentence set onto one particular 'idiom page', she is likely to view the photos and read the sentences pertaining to the same idiom made by her peers, which might lead to a reflective comparison of the contexts and the sentences constructed. This is a potential form of incidental language learning as the student can learn from good sentences, or identify and correct her peers' grammatical errors or wrong use of idioms. Rather than making immediate corrections when student errors occur, the researchers and the teacher would tactfully intervene or comment on students' contributions at the right time in order to provide enough time and space for the students to engage in meaningful peer discussions.

Like the target students of Case Study #1, this older group of students demonstrated their creativity in making up contexts that were associated with specific idioms. We analysed all the 481 photo/sentence sets posted on the wiki and classified them into 12 categories with respect to two dimensions, namely, 'types of physical settings' and 'types of meaning making.' 'Types of physical settings' refers to the source of the physical setting captured by each photo ('natural setting', 'physical object manipulation', 'human-enacted scenario', or 'previously published materials' such as book illustrations or TV screenshots). By 'types of meaning making,' we refer to how the associated sentence reflects the student's meaning-making on the photo (i.e. the relationships between the photo content and the sentence content), which could be 'literal meaning making', 'extended meaning making' (deductive interpretation) and 'creative meaning making' (creative interpretation). Table 1 features examples of different types of photo/sentence set with the original idioms underlined in the original Chinese sentences. To benefit the readers of this paper, we translated the Chinese sentences into English with the translations of the idioms being underlined.

Here is how we distinguish three meaning-making types:

- *Literal meaning-making*: The sentence demonstrates a direct interpretation on the photo context – all the elements stated in the sentence are visible in the photos.
- *Extended meaning-making*: The sentence demonstrates a logically deductive interpretation on the












photo context – there are elements in the sentence which are invisible in the photos but they are logical deductions from the photo context. For (F) (G) (H) (I) the additional elements are sports games, scoring full marks, a theft, and catching a fish, respectively.

- *Creative meaning-making*: The sentence demonstrates a twisted, perhaps creative or abstract re-interpretation on the photo context, i.e. other photo viewers usually would not interpret the photo in the same way. For example, in photo (I), there is no sign of feeding and eating in the photo and yet the student made up the 'plot element' of bread being fed to the geese. Sentence (J) turns the photo of two mouse devices into a metaphor as the student imagined that they were living things which collided with each other.

The variety of photos and sentences may have reflected the students' (at least those active ones) greater interest and attention to their surroundings and their more conscious attempts to associate their daily experiences with the learnt idioms – be it during the idiom classes, in the school compound, at home, during family outings or when they read books or watch TV shows. The students' sense of the lack of 'natural' contexts for them to take idiom-related photos was compensated by their creativity in manipulating physical objects, enacting relevant situations, or appropriating relevant published materials as resources.

Kovecses and Szabco (1996) define idioms as linguistic expressions whose overall meaning (known as figurative/idiomatic meaning) cannot be predicted from the meanings of the constituent parts (known as literal meaning). Such a distinction often poses a challenge to idiom learning (Charteris-Black 2002) as students who mistakenly rely more on an idiom's literal meaning for comprehension are likely to apply the idiom in wrong contexts. Indeed, among the students' contributions, there are photo/sentence sets which seem to fall into the categories of extended or creative meaning-making but turn out to be inappropriate uses of idioms in wrong contexts – many of which were because of the influence of literal meaning. In this regard, such a learning activity that emphasizes more on student-identified contexts and creative outputs would become an effective means in teasing out students' potential common misconceptions in idiomatic usage, which could be revised and corrected through student discussions and teacher's timely intervention.

Table 1. Various types of photo contexts and students' meaning-making.

	Natural setting	Physical object manipulation	Human-enacted scenario	Previously published materials
Literal meaning-making	 <p>(A) 这里有两只一模一样的螃蟹。 These two crabs are <u>as alike as two peas</u>.</p>	 <p>(B) 那些车横冲直撞，真是不知道他们怎么驾车！ Those cars <u>are romping about</u>. I am doubtful about the driving skills of the drivers.</p>	 <p>(C) 小青正在睡觉，小蓝不想吵到小青所以她轻手轻脚地走了过去。 Xiaoqing is sleeping. Xiaolan <u>passes her by quietly</u> so as not to disturb her.</p>	 <p>(D) 老板怒气冲冲地样子好可怕。 The boss looks fierce when he is <u>in a rage</u>.</p>
Extended meaning-making	 <p>(E) 哥哥平时不爱运动可是却可以在小学的运动会上一鸣惊人地得了第一名。 My brother does not like sports activities. Yet <u>he excels unexpectedly and comes in first</u> the Primary School Sports Meet.</p>	 <p>(G) 小明手舞足蹈因为他得了一百分。 Knowing that he has scored full marks, Xiaoming <u>dances with joy</u>.</p>	 <p>(G) 小明偷了伟德的钱包，伟德火冒三丈对小明拳打脚踢起来。 Knowing that Xiaoming has stolen his wallet, Weide <u>beat Xiaoming up in his rage</u>.</p>	 <p>(H) 明明抓到鱼儿时就眉开眼笑。 Mingming <u>grinned from ear to ear</u> when he managed to catch the fish.</p>
Creative meaning-making	 <p>(I) 鹅们津津有味吃我们给的面包。 The geese enjoyed eating the bread we provided <u>with relish</u>.</p>	 <p>(J) 它们俩横冲直撞，最后意外发生了！ They were <u>romping against each other</u> and in the end resulted in an accident.</p>	 <p>(K) 看到工人这样做，非常危险。所以，我一言不发，怕吓到她。 On seeing the worker doing a risky act, I <u>tried to keep quiet so as not to</u> frighten her.</p>	(no example fits this cell)

During the only Activity 4 session conducted towards the end of the study, each student group compared the photo/sentence sets posted on the assigned 'idiom page'. Through their group discussions, they managed to identify and explain all the erroneous artefacts, and offered good proposals to correct or improve the sentences (e.g. to replace an idiom with a more suitable one).

Discussion

Researchers have been investigating the facilitation of improvisation and creative learner outputs of various forms as a potentially effective means of language learning, with or without the use of technology (e.g. Sun & Cheng 2000; Hodson 2008). Mobile technology was a key and unique element in supporting *in situ* improvisation and creative output such as taking suitable pictures in an appropriate context to illustrate the prepositions or idioms under study. In the context of the two case studies, while improvisation and creative output are not unique affordances of mobile computing, mobility makes it unique by enabling students to do so when and wherever they so desire. While such language learning activities can be carried out without technological support, the mobile affordances of *in situ* data collection (in particular, the digital camera function) enable the students to capture and share their artefacts with others as well as help the teacher and other students to visualize idiom-and-context associations.

In this paper, the two case studies would form a trajectory that demonstrates early strategies in our longer-term quest of nurturing students' self-directed seamless learning practices (Wong 2010), i.e. individual students are able to integrate formal and informal learning, and personal and social learning, on their own without the need of teachers' scaffolds or facilitation. In contrast with the smooth enactment of Case Study #1, the challenges that surfaced in Case Study #2 have helped us in identifying the gaps between formal learning styles and the hybrid formal–informal learning style. In Case Study #2, our initial intention of leveraging on digital natives' eagerness to share their real-life experiences 'on-the-fly', mediated by mobile devices and Web 2.0 (e.g. Prensky 2004), did not take off. We need to do more research on such interventions that seek to nurture their Web 2.0 practices for participatory learning. Our findings prompt us to explore these strategies to prepare

and facilitate the students who will be involved in the full-scale study in the following year.

These pilot studies have informed us that pertaining to personalized learning, the student artefacts show some indicators of personalized seamless learning, i.e. students' proactive association of what they have learnt in-class with what they are experiencing in daily life. Pertaining to peer learning, the meaning-making practices had facilitated ongoing student discussions and inductive comparisons of varied student-identified contexts.

Indeed, this learning process design is grounded in several existing approaches proposed and studied by language theorists and yet with some novelty. It is inductive vocabulary learning, yet not entirely based on teacher-supplied resources (e.g. Mishan 2005) but student-generated ones, which are thus more authentic to the students' daily lives. It is language learning by meaning-making, yet not through reading or conversational comprehension (e.g. Donato 1994), but through students' preposition-context or idiom-context associations. It emphasizes contextual learning, productive outputs and socio-constructivism. Moreover, it reinforces a principle of language learning – make errors work for the students and not against them (e.g. Rubin & Thompson 1982). In Case Study #2, an 'idiom page' that contains correct, ambiguous and erroneous idiom-and-context associations would turn out to be an excellent venue for student discussion.

What makes our work unique from similar prior studies by Joseph *et al.* (2005), Hasegawa *et al.* (2008) and Pemberton *et al.* (2009) is that they treated learner-created content as the 'end', i.e. once verified by the instructors, the content would then become relatively static learning materials accessible by their peers for individual online learning. The Cloudbank system developed by Pemberton *et al.* (2009) does provide the functionality for further discussions on the learner-created content, but it does not seem to emphasize such activities. In our seamless language learning design, the learner content is merely the 'means' for fostering further peer learning and social meaning-making in an inductive manner. Together with the activities of watching idiomatic animations at the early stage of the study, this seamless language learning process fulfils Nation's (2001) three-stage process for vocabulary learning and turns the language subject into an authentic learning experience.

Conclusion

In this paper, we present two related case studies within the MALL paradigm that are both creative output-centric and seamless learning-inclined. These two areas with great potential had been seriously underexplored in prior MALL studies. While the results of the two case studies are promising, much work need to be done in ensuring young students' learning motivation and enthusiasm during in-class mobile-assisted learning could be extended to the situations in which they are outside of school. With appropriate design and implementation of seamless language learning, we envisage that MALL has the potential of revolutionizing the language learning field by students' use of mobile devices as personal learning tools to synergize formal (in-class) and informal (out-of-class) language learning spaces.

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