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Implications of students' vocabulary growth in a seamless language learning environment mediated by handhelds and social media

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Abstract: MyCLOUD is a mobile- and cloud-based seamless language learning approach with the aim of nurturing a social network-mediated learning community for young learners of Chinese as a second language. The intention is to sustain a language learning environment for the learners to utilize Chinese language in their day-to-day life through an extensive period of creation and sharing of social media and online interactions in the target language. In this paper, we concentrate upon exploring corpus-based analysis with a particular interest in determining the patterns of vocabulary usage, as vocabulary competency is regarded by scholars as an indicator of language competency. By facilitating the activities over a period of 13 months, we observed that the students gradually established their habit-of-mind in autonomously making meaning through interacting with their living spaces. That resulted in the utilization of richer vocabulary and the application of the language, particularly the use of significantly more "less frequent words" in the informal learning spaces. In the light of our findings, we stretch the theoretical explications of situated learning and authentic learning by connecting them with the students' intentionality in learning, with the "joint mediation" of the contextual affordances (the triggers for meaning making), social media network (to give students the sense of "communication with a purpose") and the their handhelds (the tool for artifact creation and a reminder of their involvements in MyCLOUD) to sustain their intentionality and therefore the cumulative growth of their language competences.

Keywords: seamless language learning, mobile-assisted vocabulary learning, contextual affordances, corpus analysis, learning analytics

1. Introduction

Effective language learning should result in fluent use of language knowledge for self-expression and communication in authentic situations. Such objectives are nevertheless seldom achieved, especially in the context of second language (L2) learning. Conventional language classrooms tend to practice teacher-centric, behaviorist instructions (Plank & Condliffe, 2011), which miss the complexity and contextualized nature of communication (Canagarajah & Wurr, 2011). In contrast, the sociocultural perspectives of language learning foregrounds the need of situating learners in authentic contexts of social interaction where language learning and language use co-occur (Swain & Lapkin, 2000). However, most L2 learners are not residing in the society that offers the opportunities for authentic use of their target languages, thus hindering the development of their communicative abilities.

Nurturing learners' disposition in autonomous language learning by leveraging learning opportunities arising from their daily life could be greatly facilitated by the mobile technology. Seamless Language Learning (SLL) is one such learning model. Chan et al. (2006) posited a domain-independent model of seamless learning in leveraging 1:1 (one-mobile-device-per-learner) to facilitate anytime, anywhere learning. The model emphasizes the bridging of learning across a variety of learning spaces (e.g., formal/informal learning, individual/social learning, and learning in physical/ digital realms). Over the years, the model has been adopted by scholars to inform the redesign of language learning practice (Wong, Chai, & Aw, 2015).

This paper investigates the learning growth of primary school students engaged in an iterative SLL process mediated by a mobile- and cloud-assisted Chinese Language learning environment entitled MyCLOUD (My Chinese Language ubiquitOUs learning Days). In particular, the paper focuses on the vocabulary growth as reflected in the students' linguistic artifacts created over a year. With the aid of a corpus analysis tool, the statistics of the students' vocabulary usage was analysed in order to discover the usage patterns across the time and across different learning spaces where individual artifacts were created. Implications will be drawn to inform researchers and practitioners on the practices that could help to promote pervasive language learning supported by the technologies.

2. Literature Review

2.1 Contextualised Vocabulary Learning

Since 1980s, there was a gradual shift of the study area for L2 learning from grammar to vocabulary (Pignot-Shahov, 2012). Wallace (1988) posits that a good knowledge of grammar may not necessarily enable one to communicate; however, it is possible to communicate if one has sufficient vocabulary. Thus, studies in both Chinese and English learning have shown that vocabulary competency is a key indicator of language competency (Iwashita, Brown, McNamara, & O'Hagan, 2007; Jin & Mak, 2012). The attention on vocabulary requires language educators to articulate what it means to know a word. Channell (1988) defines L2 vocabulary acquisition as 1) the meaning of a word can be recognized both in and out of real-world contexts, and 2) it can be used naturally and appropriately to situation. This underlines the importance of moving beyond word list memorization and drills, which are still widely practiced in many K-16 language classes (Horst, 2014) and adopted by most developers of mobile apps for vocabulary learning. While such methods may allow a considerable number of words to be memorized efficiently, it has little to offer in addressing the chief learning goal of expressing oneself in an extensive range of authentic communicative situations (Ang, 2014).

This leads researchers to swing their attention to learning from context in which the target word is embedded. A well-studied strategy is vocabulary learning through reading (Huckin, Haynes, & Coady, 1993). That is, the target words are embedded in passages to offer context cues for the learners to acquire through reading comprehension. However, "passive vocabulary" received through listening or reading situations does not automatically result in the building of "active vocabulary" that could be used in speaking or writing situations (Laufer & Paribakht, 1998). Reading comprehension alone limits learner's opportunity to use the new words for authentic, communicative purposes (Sun, Zhang, & Scardamalia, 2010).

Thus, for comprehensive vocabulary learning, it is necessary to elevate one's passive vocabulary knowledge to active knowledge. Nation (2001) proposes a three-stage psychological process for successful vocabulary learning: noticing (a word is highlighted as being salient text input in, say, reading comprehension), retrieving (repeat encountering of the word), and generating (a previously encountered word is used in a slightly different context). The model stresses the coupling of receptive and productive learning, and the learners' generative use of the learned vocabulary in multiple contexts (Wong, Chin, Tan, & Liu, 2010). A viable strategy to support learners' growth in active vocabulary is to situate them in the authentic contexts to generate linguistic outputs such as social media with text. Thus, the MyCLOUD project leverages on social media and students' interest in sharing about their daily life to build a community for L2 learners' authentic communicative use of the target language.

2.2 Leveraging Contextual Affordances for Seamless Language Learning

The general notion of seamless learning (Wong & Looi, 2011; Wong, Milrad, & Specht, 2015) emerges in response to criticism against decontextualized formal curricula. Current literature argues for a change in the culture of learning from separatist to seamless (e.g. Barab & Roth, 2006); specifically in the field of language learning (e.g., Levy & Kennedy, 2005). Seamless learning may inform the redesign of language learning practice with the intention of foregrounding contextualization, authenticity, and the learn-apply-reflect model of language learning (Little, 2007), through the bridging of diverse language learning tasks across different settings. This is congruent with modern language learning theorists'

proposition that language teaching should shift towards leveraging *contextual affordances* that learners can tap into for creative and self-directed learning (DaSilva Iddings & Jang, 2008). Patterns in language development are neither naturally pre-specified in language learners/users nor are they triggered solely by exposure to input. Instead, language behavior emerges from the interaction between the user and the user's environment (including both the living and social spaces) (Ellis & Larsen-Freeman, 2006). In light of the above explications, Wong, Chai, et al. (2015) propose a SLL framework that recommends the following design principles:- (1) create opportunities for authentic language learning; (2) interweave language input and output activities; (3) interweave language learning, application and reflection activities; (4) promote learner co-construction of linguistic knowledge. Thus, an SLL learning journey is pervasive and open-ended, which consist of interwoven learning activities, either facilitated by the teachers or self-initiated by the learners, and either planned or incidental. It serves as a means to embed language learning into the students' everyday life and social spaces.

3. The Study

3.1 The MyCLOUD Pilot Study

A class of 37 Primary 3 (9-year-old) students who were studying Chinese L2 participated in the pilot study between August 2011 and August 2012. The students were equipped with smartphones and data connection plans. A cloud-based platform was developed to facilitate the online learning community mediated by mobile social media. Informed by the SLL framework, the researchers and the Chinese teacher co-designed and enacted the MyCLOUD learning process over the 13-month intervention. The lesson usually began with classroom teaching of a textbook passages with embedded target words. Subsequently, the students used their smartphones to participate in a range of learning activities: (a) selecting unfamiliar vocabulary from the textbook passages and checking for meanings and examples of usage from the web; (b) creating social media (taking pictures and making sentences associated with the target words) based on the contexts in daily life; (c) posting the student artifacts (social media) and writing comments for their peers' artifacts on the platform. In particular, for activities (b), the students were encouraged to go beyond the assigned tasks by creating more artifacts in a self-directed manner.

Informed by the theoretical expositions on early focus on vocabulary, contextualized vocabulary learning and the interplay of receptive and productive activities, the learning goal of MyCLOUD is to improve the students' competencies in expressing their encounters and thoughts in Chinese, particularly in the richness of in-context vocabulary use. This paper therefore focuses on quantitatively analyzing the vocabulary growth and usage patterns in the 1,043 artifacts that the students created over the 13-month intervention. Guided by the following research questions, we seek to evaluate the effectiveness of the intervention in the students' vocabulary learning,

RQ1: How did the students' artifact creation and their vocabulary usage change over time?

RQ2: How did the students' artifact creation and their vocabulary usage vary across different learning contexts/spaces?

On RQ1, we divided the intervention period into four stages for comparative analysis, with three months in each stage (except for four months in stage 1). On RQ2, we classified the student artifacts according to the learning space where each artifact was created: classroom, home, other location, and (based on) online photos (as the students were also allowed to search for and download online photos for artifact creation). The photos offered important cues for categorization. Member checking on 'ambiguous' artifacts was sought, i.e., the creators of individual artifacts were asked to confirm where they took the photos at/from. Further analysis with "classroom" artifacts being classified under "formal artifacts", and "home", "other location" and "online photos" being grouped together as "informal artifacts" for comparison was also carried out.

3.2 Data Analyses

The primary data source were the 1,043 student artifacts posted on the MyCLOUD platform during the study period. The text components of the artifacts were imported to a Chinese corpus analysis system known as "Lingjoin Text Mining & Semantic Parser" (Goh, Lin, & Zhao, 2014). Co-developed by

Singapore Centre for Chinese Language (SCCL) and Lingjoin Zhongke Software (Beijing) Ltd., the system performs automated word segmentation, word class tagging, and computing the numbers of occurrences of individual words on an imported corpus. The preliminary vocabulary statistics were then processed by the researchers and the following sets of statistics were generated with the aid of Microsoft Excel:

(a) Types and tokens: The vocabulary types (number of different, unique words) and tokens (total number of words) used in the 1,043 artifacts are determined as low-level indicators of the richness of vocabulary usage.

(b) Lexical Frequency Profiles (LFP): One of the major determinants of vocabulary use in linguistic production is the vocabulary size of the language learner/user. Measures of lexical richness attempt to quantify the degree to which a varied and large vocabulary is used in spoken or written texts (Laufer & Nation, 1995). Laufer and Nation (1995) proposed Lexical Frequency Profile (LFP), which counts the number of word tokens in a text and distributes them among four frequency bands which are derived from standardized word frequency lists, namely, the first 1,000 and the second 1,000 frequent word families, academic words, and other (low frequency) words. Studies found that learners who used higher percentages of high-frequency words in their texts scored lower in the vocabulary tests, and vice versa (Nation, 2001). Use of low frequency words in free writing is thus an indicator of richness in one's vocabulary, as low frequency words are typically domain-specific terms or more difficult words. As the MyCLOUD study was taken place in Singapore, we adopted the "SCCL Word List" which was generated according to word frequencies based on a corpus comprising of linguistic artifacts of K-12 students in Singapore (Goh et al., 2014). Nevertheless, there is no banding in this list of 10,283 words. It is important to note that specification of numbers of words in these bands in the original LFP measure is not a hard rule. For the purpose of our study, the first 1,000 words and the next 2,000 words were taken for bands 1 and 2.

(c) The quality of student artifacts: We co-developed a rubric with the teacher to assess the quality of the student artifacts in three aspects:- task completion, expression (context) and language (accuracy of linguistic usage). Based on this rubric, each artifact was graded on a scale of 0-5. Two researchers graded all 1,043 artifacts independently. The Pearson correlation value (.91) indicates good inter-rater reliability. Differences were resolved through discussion and the scores of all the artifacts created within individual stages were then calculated as the primary indicators of the artifact quality. More details of the rubric including its validation process is given in Liu, Wong, Toh, and Li (2015).

4. The Study

4.1 Comparison of the statistics across the four stages

Table 1 presents the statistics of overall and stage-by-stage artifact creation activities and vocabulary use with one-way repeated measures ANOVA being performed. The results show that there was a significant increase in the numbers of artifacts in the last two stages as compared to the first two stages. There was a statistically insignificant decrease in the number of artifacts in Stage 4 as compared to Stage 3. Yet significantly more word types were utilized in Stage 4, indicating longer texts and richer vocabulary in the stated stage. There were also significant increases from Stage 3 (and/or from the first two stages) to Stage 4 in mean artifact score. These are strong indicators of students' growth in terms of artifact quality and the diversity of vocabulary use. Figure 1 gives examples of the artifacts created by the same student over the four stages.

Repeated measures were also performed on the LFP statistics in Table 2. In order not to overwhelm the readers with abundant figures, only the comparisons of the percentages of band 1 (higher frequency) words are presented – we favor lower percentages of the use of band 1 words as that means the students had not been over-reliant on these relatively simple and commonly used words but were more inclined to present their thoughts and experience in with a greater diversity of vocabulary. As seen in Table 2, there were little differences between Stages 1 and 2, but a significant increase in the proportions of less frequency words used in Stages 3 and 4 as compared to the earlier stages.

Table 1: One-way repeated measures ANOVA on student artifact statistics across the four stages.

		Total	Stage 1 (1)	Stage 2 (2)	Stage 3 (3)	Stage 4 (4)	*F*	*Partial ETA Square*	*Pairwise Comparisons*†
Number of artifacts	Total	1043	77	151	443	372	19.7**	.354	3 > 1**, 2**
	Mean	28.2	2.1	4.1	12.0	10.1			4 > 1**, 2**
	SD	20.6	2.6	4.2	10.1	10.3			
Mean artifact score	Mean	3.28	3.11	3.01	3.20	3.60	11.46 **	.469	3 > 1*
	SD	.32	.20	.37	.34	.54			4 > 1**, 2**, 3*
Word types	Total	1864	125	494	995	1287	69.9**	.660	2 > 1**
	Mean	166.9	6.3	26.7	76.4	91.1			3 > 1**, 2**
	SD	110.2	5.8	18.3	54.4	63.8			4 > 1**, 2**, 3**
Word tokens	Total	14949	544	1957	5833	6615	13.14**	.267	2 > 1**
	Mean	404.0	14.4	51.8	154.4	182.4			3 > 1**, 2**
	SD	399.1	31.9	60.1	152.6	262.2			4 > 1**, 2**

† Pairwise comparisons of means with Bonferroni post-hoc tests
Note: *p < .05, **p < .01

Table 2: One-way repeated measures ANOVA on the LFP statistics across the four stages.

		Overall Mean (SD)	Stage 1 (1) Mean (SD)	Stage 2 (2) Mean (SD)	Stage 3 (3) Mean (SD)	Stage 4 (4) Mean (SD)	*F*	*Partial ETA Square*	*Pairwise Comparisons*†
SCCL list	Band 1	80.9% (4.7%)	82.8% (9.6%)	79.4% (15.5%)	78.9% (7.8%)	72.6% (16.4%)	5.3*	.128	1 > 3*, 4*
	Band 2	8.0% (2.7%)	3.2% (2.4%)	5.4% (6.5%)	6.1% (2.6%)	7.4% (8.4%)			
	Others	11.1% (.3%)	14.0% (8.2%)	15.2% (12.9%)	15.1% (6.7%)	20.0% (10.7%)			

† Pairwise comparisons of means with Bonferroni post-hoc tests
Note: *p < .05, **p < .01

Stage 1	**Stage 2**	**Stage 3**	**Stage 4**
			
我的爸爸在看报纸。 “My father is reading newspaper.”	我的妹妹安静的读书，她读得津津有味。 “My sister is quietly reading a book with relish.”	这是我的午餐，我吃不完了。妹妹说我的脸白白，想要吐的样子。 “This is my lunch. I can’t finish it. My sister says my face is pale, like I’m going to throw out.”	这是妈妈和爸爸的房间，我和妹妹也在这里睡觉。有一天，爸爸和妈妈买了新的床。他们买了新的床给我，妹妹和他们自己。我和妹妹的是双架床，我睡在上面，妹妹睡在下面。妈妈和爸爸的是高高的床，他们说不可以在上面跳，可是妹妹每次跳在上面。每天晚上，妹妹会去我的床睡觉。可是妈妈叫她下来，让我睡觉。 “This is mom and dad’s room. My sister and I are sleeping here as well. One day, dad and mom bought new beds for me, sister and themselves. Sister and I are sleeping on a double deck bed; I’m sleeping on the upper deck, and my sister is sleeping on the lower deck. Mom and dad’s bed is tall. They said we shouldn’t bounce on the bed; but we are still doing so. Every night, sister would sleep on my bed; but mom told her to get down so that I can sleep.”

Figure 1. Examples of artifacts created by the same student in the four stages (with English translation).

4.2 Comparison of the statistics across the artifacts created in different contexts

Table 3 summarizes the statistics of various measures on context-by-context artifact creation activities and vocabulary use. The statistics indicate that the majority of artifacts were created either in-class or at home (thus greater amounts of word types and tokens). This probably reflects typical young students’ living circles that are limited to the school and home. Nevertheless, the total artifacts from all informal contexts were about 2.5 times more than the in-class artifacts. The results indicate that extending such activities beyond the classroom would not only help the students to break the constraints of time and space; the rich and authentic daily experience could provide them more inspirations and triggers of vocabulary use, resulting in the improvement of the richness and quality of the artifacts created. Figure 4 gives examples of artifacts that a student created in these four types of learning contexts.

Table 3: One-way repeated measures ANOVA on statistics of student artifacts across different spaces.

		Over-all	Class ***(formal)*** (1)	Home (2)	Other locations (3)	Online photos (4)	Home + other + online ***(Informal)*** aggregated (5)	*F*	*Partial ETA Square*	*Pairwise Comparisons*†
Number of artifacts	Total[a]	1043	294	462	147	140	749	14.06**	.281	1 > 3**, 4**
	Mean	28.2	8.0	12.5	4.0	3.8	20.2			2 > 3**, 4**
	SD	20.6	5.8	13.2	2.6	4.7	16.5			
	Formal vs. informal							28.24**	.440	5 > 1**
Mean artifact score	Mean	3.28	3.14	3.35	3.53	3.25	3.36	3.23*	.152	3 > 1*
	SD	0.32	0.42	0.32	0.58	0.56	0.37			
	Formal vs. informal							10.3**	.223	5 > 1**
Word types	Total[a]	1864	792	1129	598	524	1624	13.15**	.268	1 > 3**, 4**
	Mean	166.9	70.7	80.9	38.8	26.8	146.5			2 > 3*, 4**
	SD	110.1	49.7	82.3	26.9	36.9	110.9			
	Formal vs. informal							32.9**	.478	5 > 1**
Word tokens	Total[a]	14949	4105	6865	2174	1805	10844	7.88**	.180	1 > 3**, 4**
	Mean	404.0	111.0	185.5	58.8	48.8	293.1			2 > 3*, 4*
	SD	399.1	89.9	283.9	43.6	66.8	321.8			
	Formal vs. informal							19.2**	.348	5 > 1**

Note: Total[a] indicates class total.
† Pairwise comparisons of means with Bonferroni post-hoc tests
*p < .05, **p < .01

Repeated measures ANOVA was also performed on the LFP statistics in Table 4. The results indicate that the proportions of the band 1 word usage in the in-class artifacts significantly higher than artifacts created at home, in other locations or based on online photos respectively, as well as higher than aggregated informal artifacts.

Table 4: One-way repeated measures ANOVA on LFP statistics across different spaces.

		Class Mean (SD) (1)	Home Mean (SD) (2)	Other locations Mean (SD) (3)	Online photos Mean (SD) (4)	Informal aggregated Mean (SD) (5)	*F*	*Partial ETA Square*	*Pairwise Comparisons*†
SCCL list	Band 1	87.5% (7.9%)	76.0% (8.4%)	76.5% (8.8%)	77.7% (10.7%)	77.3% (6.6%)	14.14*	.344	1 > 2**, 3**, 4**
	Band 2	7.0% (5.1%)	10.0% (5.1%)	8.9% (8.7%)	15.6% (14.4%)	8.7% (3.5%)			
	Others	5.6% (3.8%)	14.0% (6.7%)	14.6% (7.0%)	34.0% (36.7%)	14.1% (4.8%)			
	Class vs. informal						28.54*	.464	1 > 5**

Note: † Pairwise comparisons of means with Bonferroni post-hoc tests
*p < .05, **p < .01

Class	**home**	**Other locations**	**Online photos**
			
因为我跌倒，所以教练说：“你永远不会游泳！” “I fell down. So my coach said, ‘You will never be able to swim!’” *(Note: The student group enacted a scenario that utilised the assigned word “never”.)*	这是我的妈妈新买给我的扑满。这个扑满可以行拆除也可以放回的，很好用，也很方便。 “This is a piggybank which my mother bought me. It can be dismantled and then reassembled. It’s very useful and convenient.”	我在门口拍了这张照片。我看到了这两只动物。我觉得那只羊很可怜。因为它旁边的蛇看起来像要吃它一样。这张照片很有趣。 “I took this photo at the front gate *[of Haw Par Villa – a local touristic park with sculptures]*. I saw the two animals. I pity the goat, as it seems that the snake is going to eat it. This photo is very interesting.”	我在圣淘沙玩泥沙。 “I was playing in the sand on Sentosa Island.” *(Note: This is actually a photo downloaded from the web.)*

Figure 2. Examples of artifacts created by the same student in different contexts (with English translation).

5. Discussion

In this paper, we delineate a seamless language learning approach with the aim of nurturing a social network-mediated learning community of L2. The intention is to sustain a language learning environment for the learners to utilize the target language in their day-to-day life. Indeed, this is not just a community of learners, but also a community of practice in a loose sense, where language learning and applications are interwoven. In the age of Web 2.0 where sharing and interactions in the social media spaces have become regular, day-to-day activities for netizens, the socializing contexts arising from such activities could be regarded as another form of authentic contexts which are conducive to the facilitation of the communicative approach of language learning (Wong, Chai, et al., 2015).

The year-long intervention period of MyCLOUD had resulted in a rich set of data that warrants analyses under/with a variety of theoretical lenses and methods. In this paper, we concentrate upon exploring corpus-based analysis to determine the patterns of vocabulary usage – as vocabulary learning is one of the domain-specific learning goals of MyCLOUD. The proliferation of learning analytics is opening up new opportunities for language learning researchers, practitioners and learners themselves to carry out both formative and summative evaluations based particularly on the learners' ongoing productive learning activities (here, 'productive' refers to learner artifact creations). In our study, we employed an existing corpus analysis tool to perform vocabulary segmentation on the data. The preliminary vocabulary statistics were then analyzed in a greater depth with the aid of Excel and SPSS.

5.1 Contextual Learning as a Cumulative Process

Based on our analysis on the students' vocabulary usage across the four stages, the positive and statistically significant development of the usage patterns (in terms of word types and tokens, new words used, number of artifacts, mean artifact score and LFP) echoes Nagy (1997) and Nation's (2001) arguments that contextualized language learning is a cumulative process which results in small but positive gains in each encounter. The four artifacts in Figure 1, which are fairly representative of the artifacts created by the entire class in the respective stages, may provide some clue for the rationale behind the growth. In Stages 1 and 2, students were in general new to the social media activities. They considered such activities as a multimodal version of sentence making exercise as part of their formal curriculum. Therefore, they were inclined to compose single sentences with proper grammar and correct usage of words (the standard benchmark in sentence making assessments to get full scores), without worrying about the plainness and superficiality of the contexts. Over the time, they observed some classmates' attempts in sharing their real-life encounters with extended contexts such as relating to their personal feelings or past experience. Such peer influences prevailed in Stages 3 and 4 when the sense of community of "Chinese Language social network" was gradually developed. Thus, the students' motivation in artifact creations had not only been well-sustained but even elevated (in terms of number of artifacts); and their linguistic/communicative competences had therefore been cumulatively improved (in terms of mean artifact score).

5.2 Leveraging Contextual Affordances to Elevate the Language Learning Gains

The more important aspect of this study is the students' vocabulary usage patterns across different learning spaces. Though most of the artifacts were created within classroom or at home due to the students' natural living style, both the mean artifact score and the LFPs are indicating higher quality of artifacts and the use of less frequent words in informal contexts (versus formal contexts), and in 'other locations' (versus classroom).

The purpose of such artifact creation tasks in MyCLOUD is to immerse the learning process into the students' authentic daily life with the appropriation of contextual affordances. In the aspect of language learning, we see such activities as the key to reduce the students' passive-active vocabulary gaps (i.e., to assist the students in transforming more passive vocabulary into active vocabulary). The learners' artifact creation activities in their daily life can be characterized as spontaneous meaning making through interacting with their living spaces to trigger the retrieval of the relevant learned vocabulary and the application of the language. That is, whenever and wherever a learner senses that her in-situ encounters (objects, people and/or events) or her personal behavior (i.e., her interaction with the context) are suitable topics for artifact creation, she may appropriate such contextual affordances to mediate her meaning making, which in turn mediate her language learning/application. The more

enriched language learners' contextual affordances are, the more developed their meaning-making processes will be (Ozkose-Biyik & Meskill, 2014).

Specifically, our findings indicate the superiority of the students' linguistic outputs (in terms of LFP) from the informal spaces as compared to those from the formal spaces. Our rationale is that typical classrooms as bound, 'artificial' and 'standardized' spaces designed for the delivery of formal curriculum do not offer rich and diversified contextual affordances that warrant authentic meaning making. Although students may collaboratively imagine and enact scenarios set in out-of-class spaces (e.g., the leftmost artifact in Figure 2), they are more inclined to retrieve meanings or concepts corresponding to their familiar vocabulary in constructing such scenarios. The informal spaces, however, may offer much more novel and stimulating contextual affordances which are unavailable in the classroom. The students' embodiment to the authentic physical spaces that warrant their firsthand experiencing of and interactions with the environment would push them to go beyond what they would produce in traditional sentence making practices. For example, the rightmost artifact in Figure 1 was incidentally inspired by the family's purchase of new beds, and how the kids were physically interacting with the beds and verbally interacting with other family members pertaining to the beds.

5.3 The 'Joint Mediation' of In-Situ Contextual Affordances, Handhelds and Social Media for a Sustainable Self-Directed Seamless Language Learning Journey

Carrying on from the exposition in the previous sub-section, we are cognizant that the availability of the authentic, contextual affordances alone was not a sufficient condition for the students to self-initiate artifact creations in informal spaces. Indeed, whereas the teacher facilitated in-class artifact creation activities to prepare the students, she did not make after-school artifact creation a mandatory activity for the students, and neither tied the student artifacts to formal assessments. This is because we advised her not overly "formalize" the supposedly informal-oriented learning activities or the students might fall back to the mindset of formal sentence making activities – to compose sentences in some "standard" ways to score high. In this regard, what it really takes is the sense of learner agency; in particular, of intentionality. Intentionality represents the power to originate actions for a given purpose, "To be an agent is to intentionally make things happen by one's actions" (Bandura, 2001, p. 2). The students ought to be intentional to spontaneously make personal sense out of what they encounter and use affordances in ways that are personally meaningful and relevant.

Therefore, in designing the seamless language learning activities with self-directed linguistic outputs largely emerged from informal contexts, there is a need to foster the sustainable condition of "joint mediation" (Wong, Chen, & Jan, 2012, p. 417) of multiple tools/artifacts, particularly the learners' personal handhelds and the social media network, to fuse together the contextual affordances and learners' intentionality. The handhelds that the learners possess 24/7 not only enable them to create and share social media, but also serve as a reminder on their involvement in such an ongoing and exciting learning journey where they are strongly encouraged to proactively identify authentic opportunities to make meaning with the target language. Moreover, the learners are well-aware that they could share their social media artifacts with their classmates, thus giving them the senses of authentic audience and "communication with a purpose" (as compared to traditional sentence making exercises where the teachers or the examiners were the only audience). What adds to the "thrill" and excitement is the lower stakes of the social network where they can tinker with their ideas and language without the fear of, say, academic consequences. Thus, when a learner is on a whim to create and share an artifact based on her/his authentic encounter, it is often due to the joint mediation of the in-situ contextual affordances, the personal handheld, and the prospect of sharing the encounter with the learning community via the social network. Such a joint mediation would reshape the learners' intentionality, resulting in a vastly different way of meaning making that ensues lively, authentic use of the target language and the vocabulary.

6. Conclusion and Implications

The MyCLOUD project is intended to investigate the employment of SLL to address the need of facilitating a perpetual, contextualized, productive and communicative learning process for L2 learners.

A particular learning goal is to reduce the passive-active vocabulary gaps of the students. By carrying out the low stakes social media-based interaction activities over a period of 13 months, we observed that the students gradually established their disposition in proactively and spontaneously make meaning through interacting with their living spaces - and that resulted in the retrieval of a greater diversity of the learned vocabulary and greater opportunities of language use.

A noteworthy finding is the use of more "less frequent words" in the informal spaces, as compared to those from the formal spaces. While this finding affirms the notions of situated learning and authentic learning, we stretch the theoretical explication by connecting it with the students' intentionality, with the joint mediation of the contextual affordances (the sources of inspiration for meaning making), social media network (to provide students the senses of audience and "communication with a purpose") and the their handhelds (the tool for artifact creation and a reminder of their involvements in MyCLOUD) to sustain their intentionality and therefore the cumulative improvement of their linguistic competences.

This paper therefore contributes not only to the literature of technology-enhanced language learning by unpacking what it takes to construct an environment of L2 learning/communication that seamlessly connects the formal and informal spaces with the aid of mobile social media; we believe that our rise above can be applied to the design of seamless learning environments of other subject domains, in which we recommend the creation of the conditions to facilitate the joint mediation of the above-stated affordances. More studies should be conducted to investigate how informal spaces could be appropriated by the students in a self-initiated and self-identified manner (rather than all-the-way prescribed by the teachers on what affordances to use and how they are used) to support meaningful learning of the subject domains other than language.

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