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Design of an AI-powered Seamless Vocabulary Learning for Young Learners

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Abstract: A thriving development direction of digital language learning has been to integrate mobile-based language learning and AI techniques. Nevertheless, few studies focus on investigating the affordances of AI-embedded mobile learning systems in enhancing formal language learning for young learners. This project sets out to explore how AI techniques can be used to promote Chinese language learning for young learners through strengthening learning across contexts. The present paper introduces the ongoing project by focusing on the design and development of an AI-powered seamless Chinese vocabulary learning system for Singapore lower-primary school students, named ARCHe.

Keywords: AI, second language learning, vocabulary learning, seamless learning, primary school

1. Introduction

A thriving development direction of digital language learning has been to integrate mobile-based language learning and AI techniques, such as automatic speech recognition, image recognition, and natural language processing (Li & Lan, 2021). There is a growing acknowledgement of the value of mobile-based language learning from the perspective of social constructivism, that extends language learning beyond the walls of the classroom to daily life. In this sense, the notion of seamless learning, which highlights bridging separate learning contexts and better integrating everyday experiences with formal education, has received a boost in digital language learning (Godwin-Jones, 2018).

Some studies have been conducted to enhance seamless vocabulary learning through the content delivery method via instant messaging (e.g., Li, Cummins, & Deng, 2017). Other studies regarding taking photos or video clips of what is happening in the real world and using these digital resources to help pupils to deepen their understanding of vocabulary learned in class, and bridge formal learning with everyday living experiences (e.g., Ogata et al., 2015). Moreover, some studies have adopted seamless learning games, and context-aware or ubiquitous user-generated-content systems to enhance English as a foreign language vocabulary learning and learner motivation (e.g., Mouri et al., 2018; Wang & Huang, 2017). There are also few studies on investigating primary school students' seamless learning experiences (e.g., Wong, 2016; Song & Ma, 2021). Nevertheless, these studies focus on either on-campus learning or home-based learning but pay little attention to the linkage between them. There remain little research and validated approaches on designing seamless vocabulary for young learners, linking classroom-based learning and home-based learning.

On this premise, we developed an AI-powered seamless vocabulary learning system, named ARCHe. The ARCHe-based learning activities were designed in terms of the Chinese language curriculum for primary schools in Singapore. The proportion of Chinese households in Singapore speaking English as their main language has risen sharply in the past 20 years. Children from English-speaking families increasingly lack the opportunities to use Mandarin in their daily lives. The project set out to explore how AI techniques can be used to promote Chinese language learning for young learners through strengthening learning across contexts, particularly strengthening the link between home-based learning and classroom-based learning. The present paper sough to introduce the design principles of ARCHe and elucidate how AI may help to strengthen the connection.

2. ARCHe Design Principles

2.1 Self-generated contexts

Shen and Xu (2015) provided empirical evidence to support the effectiveness of active learning in classroom vocabulary learning for beginning learners. The findings are consistent with the sociocultural perspectives and holistic ecological approaches applied to language learning, by which effective language learning is characterized by the active and constructive production of thoughtful linguistic artefacts in the settings of authentic learning (Ellis, 2000). Providing students opportunities to create their own artefacts and generate contexts of language learning is an effective approach to learning Chinese characters. Furthermore, in this sense, context does not only determine learning as an external container but is also created by learners (Wen, 2020; 2021).

2.2 Bridging home-based learning and classroom learning

Language educators should encourage learners to find ways to incorporate language learning into their daily lives, using "an adaptive pedagogy that would situate language and culture as lived practice as a central organizing principle" of foreign or second language study (Dubreil &Thorne, 2017, p. 6). That should include connecting learning experiences in the classroom to those outsides, both online and face-to-face. In this project, we aimed to design and support learning experiences that take place. Students' understanding of the target character or word can be constantly improved during the process. In many cases of seamless learning design, physical things, or artefacts that learners encounter in real-life may play pivotal roles in formal learning. These learning artefacts, however, are often neglected by learners and teachers (Coffield, 2000). The ARCHe system design focuses on promoting the generation and constant improvement of students' created artefacts across contexts.

3. AI-powered ARCHe

The ARCHe system design focuses on promoting the generation and constant improvement of students' created artifacts as well as the reflection on their experiences. Automatic recommendation was embedded in the system to enrich the contexts of vocabulary use in classrooms. For instance, while using the system at home, students are required to find materials in their life and generate the target character-related creations, such as picture taking and sentence making via text input or voice recording. After that, students could review not only all personal learning logs, but also related artifacts generated by others and recommended by the system. The generated sentences are evaluated jointly by the system and their teachers.

After that, in the classroom activity, students are assigned into small groups and label the point that they are interested in with the target Chinese character/word in the provided scenario pictures. During the process, students can use the sentences they generated previously and attach them to the new scenarios, they are also encouraged to refine or create new sentences based on the recommended artifacts. Students' understanding of the target character/word can be constantly improved during the process.

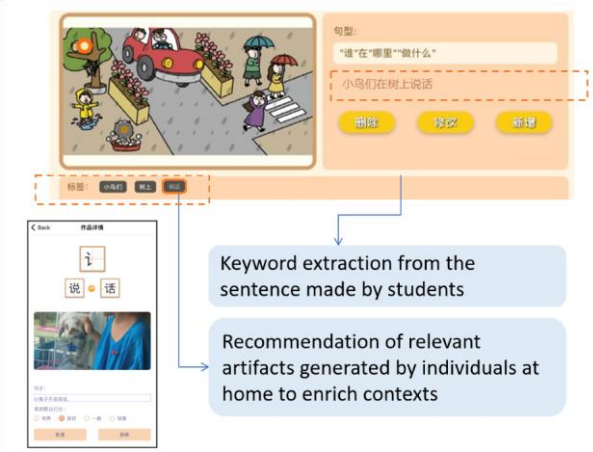

Figure 1. Automatic recommendation to bridge home-based learning and classroom-based learning and enrich the contexts of vocabulary use

Figure 1 shows an example. “Birds are talking on the tree.” was the sentence made by a group. “Birds”, “on the tree” and “talking”, these keywords of the sentence were segmented and extracted automatically. As the keyword “talking” has been used in students’ home-based learning activities, the corresponding artifact was recommended by the system. Then students can decide by themselves if they would like to expand or refine their group sentence based on the recommended sentence or not. The recommended artifacts not only provide students with sentence examples, but also enrich the context in which the target word can be used. The more actively students participate in the home-based learning activities, the more artifacts would be created, and subsequentially, more relevant artifacts will be recommended in the classroom-based activity to promote learning engagement.

4. Conclusion and Future Direction

This is an ongoing project. The ARCHe has been piloted in 6 classes of primary 2 students in three schools in Singapore. According to our preliminary observations, though the seamless learning approach was integrated into ARCHe system design, and the use of AI aimed to promote learning across multiple contexts, teachers still play an essential role in implementing the system. Teachers need supportive training beyond technical training and pedagogical training about seamless learning. Training on useful strategies for enacting collaborative learning in classrooms and engaging young learners in home-based learning might be more important. Our next study will pay more attention to the ARCHe system affordances, how teachers use them, and what kind of training should be provided.

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References

Coffield, F. (2000). The structure below the surface: reassessing the significance of informal learning. *In the Necessity of Informal Learning* (ed. F. Coffield), pp. 1–11. Policy Press, Bristol.

Dubreil, S., & Thorne, S. L. (2017). Social pedagogies and entwining language with the world. In S. Dubreil & S. L. Thorne (Eds.), *Engaging the World: Social Pedagogies and Language Learning* (pp. 1– 11). Boston, MA: Cengage.

Ellis, R. (2000). Task-based research and language pedagogy. *Language Teaching Research, 4*(3), 193–220.

Godwin-Jones, R. (2018). Contextualized vocabulary learning. *Language Learning & Technology, 22*(3), 1–19.

Li, J., Cummins, J., & Deng, Q. (2017). The effectiveness of texting to enhance academic vocabulary learning: English language learners’ perspective. *Computer Assisted Language Learning, 30*(8), 816–843.

Li P, Lan Y-J (2022). Digital Language Learning (DLL): Insights from behavior, cognition, and the brain. *Bilingualism: Language and Cognition 25*, 361–378.

Mouri, K., Uosaki, N., & Ogata, H. (2018). Learning Analytics for Supporting Seamless Language Learning using E-book with Ubiquitous Learning System. *Journal of Educational Technology & Society, 21*(2), 150–163.

Ogata, H., Uosaki, N., Li, M., Hou, B., & Mouri, K. (2015). Supporting seamless learning using ubiquitous learning log system. *In Seamless Learning in the Age of Mobile Connectivity* (pp. 159–170). Singapore: Springer.

Song, Y., & Ma, Q. (2021). Affordances of a mobile learner-generated tool for pupils’ English as a second language vocabulary learning: An ecological perspective. *British Journal of Educational Technology*, *52*(2), 858–878.

Wang, W. Y., & Huang, Y. M. (2017). Interactive syllable-based English vocabulary learning in a context-aware environment. *Journal of Educational Computing Research, 55*(2), 219–239.

Wen, Y. (2020). An Augmented Paper Game with Socio-Cognitive Support. *IEEE Transactions on Learning Technologies, 13*(2). 259-268.

Wen, Y. (2021). Augmented reality enhanced cognitive engagement: Designing classroom-based collaborative learning activities for young language learners. *Educational Technology Research & Development, 69*, 843–860.

Wong, L. H., King, R. B., Chai, C. S., & Liu, M. (2016). Seamlessly learning Chinese: contextual meaning making and vocabulary growth in a seamless Chinese as a second language learning environment. *Instructional Science, 44*(5), 399–422.

Shen, H. H & Xu W. (2015). Active learning: Qualitative inquiries into vocabulary instruction in classroom in Chinese L2 classrooms. *Foreign Language Annals*, *48*(1), 82–99.