

## Situated Poetry Learning Using Multimedia Resource Sharing Approach

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(Submitted January 20, 2012; Revised April 16, 2012; Accepted May 05, 2012)

### ABSTRACT

Educators have emphasized the importance of situating students in an authentic learning environment. By using such approach, teachers can encourage students to learn Chinese poems by browsing content resources and relevant online multimedia resources by using handheld devices. Nevertheless, students in heterogeneous network environments may have different requirements for the resource subject, type, size, etc. The central issue of this study is how to locate appropriate resources to support situated learning based on user context. In an attempt to solve the primary concern, this study proposes a context-based dialogue approach with which students may interact to retrieve adequate poems and multimedia resources. The Poetry Multimedia Resource Index is the basis for the retrieval, which consists of outer lexical resources, multimedia resource information, and Chinese poems. A prototype system has been conducted to evaluate the effectiveness of the approach. The experimental group adopts the situated learning method by using this system, while those in the control group adopt the situated learning method by using textbooks. It is found that our approach can be significantly beneficial to promote students' learning achievements. The majority of students are satisfied with the proposed system and the teacher participant showed a positive attitude toward this system.

### Keywords

Chinese poetry, Ubiquitous learning, Multimedia learning, Situated learning

### Introduction

Many students find poems difficult to understand since poetry often expresses rich and semantic life experiences using few words. Therefore, assisting learners in understanding profound meanings of a poem is quite important. Previous researches suggested that students may experience a positive learning effect by using situated learning theory (Brown, Collins, & Duguid, 1989; Herrington & Oliver, 1999; Horz, Winter, & Fries, 2009; Hwang, Shi, & Chu, 2011). When learners are situated in an environment similar to what a poem describes, they can understand what the poet meant easily, thus enhancing learning performance (Chen, 2008; Shih, Tseng, Yang, Lin, & Liang, 2012; Su, 2007). Hence, in such an environment, learners could benefit from the learning activity that they can not only browse the content of a poem but also its multimedia resources. By carrying handheld devices, which feature wireless communication capabilities, such as Personal Digital Assistants (PDAs), smart phones, and laptops, such scenario can be realized.

Previous studies show that using multimedia in courses increases students' motivation to learn and bolsters an appreciation of poems (Cai, 2003; Chen, 2008; Lo, Zhang, Lin, Tseng, & Chen, 1999; Sun & Cheng, 2007). A proverb also states that, "A picture is worth a thousand words." As information technology rapidly evolves, an increasing number of multimedia resources regarding Chinese poetry have become more accessible via the World Wide Web. Some of these resources are elaborately tailored to help explain or recite a specific poem, and the others are created to help describe a specific entity (such as people, buildings, or locations) depicted in poems. With the aid of these resources, students could better understand poems (Sun & Cheng, 2007).

To achieve the aim of Web-based e-learning, scholars showed the benefit of using an ontology-based approach for online resource management and reuse (Bedi, Banati, & Thukral, 2010; Wu, Mao, & Chen, 2009). However, the researchers were not concerned with the combination of learning contents and learning resources. Online learning resources could be unavailable or delayed, which may not result in significant positive learning performance. In Sun & Cheng (2007), the researchers also indicated that the use of rich media in an e-learning course like Chinese poetry has a significantly positive effect on learning achievement over the use of media that is low in richness. Therefore, it is important to offer available, accessible and trustworthy multimedia resources (e.g., high rich media) for students while learning. Furthermore, in an outdoor environment, due to the limitations of portable learning devices and the

bandwidth of network environments, learning requirements or learning preferences (e.g., resource subject, type, or size) need to be concerned while retrieving resources for learners. Therefore, an interesting issue concerns how to locate appropriate poems and multimedia resources for learning assistance based on the context information.

However, resource repositories (e.g., Flickr, BaiduMp3, YouTube) have their own indices as well as data structures for assisting users to rapid access to resources. With the aim of facilitating fast, reliable and accurate online trustworthy resource retrieval, it is necessary to fetch and collect multimedia resource information relating to poems for index construction. Hence, three sub-problems occurred; that is, the collection of multimedia resource information, the construction of an index from the contents and multimedia resources, and the retrieval of poems and resources from the index.

To cope with this problem, this study proposes Ubiquitous Poetry Learning Scheme (UPLS) which includes three phases: (1) Prefetch-based Resource Information Collection; (2) Poetry Multimedia Resource Index Construction; and (3) Context-based Resource Retrieval. The proposed system is implemented with the aim to conduct Chinese poetry learning activities in a situated learning environment. The aims of this research have been stated as the following research questions:

1. What are the learning achievements of students after using UPLS?
2. What are students' attitudes toward the use of UPLS?
3. What are teachers' attitudes toward the use of UPLS?

## **Related works**

The following sections review literature about the Chinese poetry research and multimedia learning, since this research is related to poetry learning using multimedia resources in a situated learning environment.

### *Chinese poetry research*

Since instruction of Chinese poetry primarily focuses on didactic education, students tend to have difficulty appreciating poems. Therefore, many researchers have proposed information technology approach for facilitating learners' understanding of poems such as style identification (He, Liang, Li, & Tian, 2007; Yi, He, Li, & Yu, 2004; Yi, He, Li, Yu, & Yi, 2005), photo tagging to express course concepts (Shih et al., 2012; Shih, Tseng, Yang, Weng, & Liang, 2008), learners' writing development (Tseng, Yang, Weng, & Liang, 2009; Wang, Tseng, Yang, & Su, 2005), and poetry comprehension (Lo et al., 1999; Sun & Cheng, 2007; Yang, Tseng, & Liang, 2011; Yao & Zhang, 2010). Among these researches, situated learning is emerging as a promising way to engage and motivate students for learning Chinese poetry (Shih et al., 2012; Tseng et al., 2009; Yang et al., 2011).

Situated learning occurs when learning is situated within authentic activity, context, and culture (Lave & Wenger, 1990). In order to provide learners with the authentic context, tutors create scenarios for learners with the real world setting. Therefore, teachers can lead students to a given scenario by simulating the environments depicted in poems and by using content resources and multimedia resources for understanding Chinese poems. In this study, an index to easily access both of them was constructed to aid in situated poetry learning.

### *Multimedia learning*

Multimedia learning is defined as learning from words (such as printed or spoken text) and pictures (such as photos, animations, or videos) (Mayer, 2009). In other words, multimedia instructions cover a wide range of instructional material ranging from a printed text accompanied by pictures to an elaborate animation in the World Wide Web. This theory draws on many other theories such as Paivio's dual coding theory (Clark & Paivio, 1991; Paivio, 1986), cognitive load theory (Sweller, van Merriënboer, & Paas, 1998), Baddeley's working memory model (Baddeley, 1992), and cognitive theory of multimedia learning (Mayer, 2009). According to Mayer (2009), a learner constructs a verbal representation and a visual representation separately when learning from a multimedia instruction. The learner then constructs an integrated representation which combines auditory verbal information with visual graphical information. Studies in the multimedia learning literature show that humans learn better from picture and text than they learn from

text only because learners are able to construct richer memory representations (Ayres & Sweller, 2005; Mayer, 2009; Ozcelik & Acarturk, 2011; Schnotz & Bannert, 2003). However, simply presenting pictorial and textual information does not guarantee enhanced learning (Sweller et al., 1998). Too much unnecessary elements in instructional multimedia material may distract learners and decrease learning performance (Mayer, Heiser, & Lonn, 2001). To reduce extraneous cognitive load, Mayer advocates understanding and application of several specific principles for instructional design (e.g., coherence principle, signaling principle, redundancy principle, spatial and temporal contiguity principles) (Mayer, 2009).

Nowadays, there has been a considerable increase in the needs of multimedia instructions. However, it is expensive to design and develop instructional multimedia materials (Dan, Feldman, & Serpanos, 1998). Due to the rapid development in ICT, more and more educators/users create instructional materials and learning resources that facilitate students to improve their learning performance. With the rapid increase in the amount of instructional materials, it is a good way to support children's learning by providing online multimedia resources. Nevertheless, these resources may or may not be well designed (Mayer, 2009). To assist learners in developing meaningful learning experiences, trust degree is set for each collected multimedia resources in this study. Students could learn better from trustworthy multimedia resources.

### Ubiquitous Poetry Learning Scheme (UPLS)

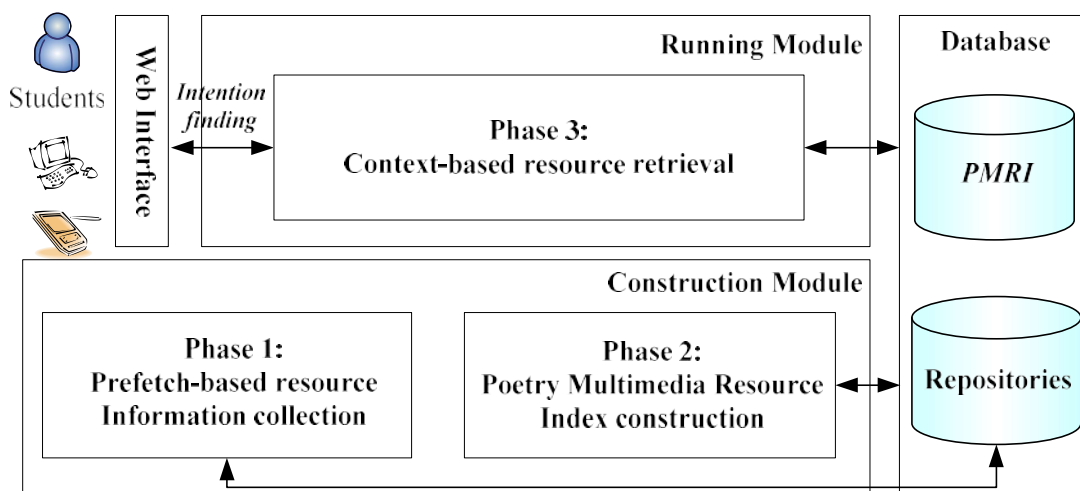


Figure 1. System architecture of UPLS

In this study, a three-phase approach is proposed to locate adequate poems and resources based on context information. Figure 1 illustrates the system architecture of UPLS.

1. **Prefetch-based resource information collection phase:** The information of ROs (Resource Objects) which are related to poems are prefetched and stored in different repositories in this phase. Besides, the context information of retrieved ROs is refreshed after a period of time.
2. **Poetry multimedia resource index construction phase:** The web crawler gives the indexer the full information of ROs it finds. The retrieved information of ROs are stored in the repositories. The index (PMRI) is built by combining TYCCL (Mei, Zhu, Gao, & Yin, 1984) with poems and resources due to the fact that TYCCL is a well-known Chinese vocabulary indexing thesaurus and a well-defined knowledge structure. This data structure allows rapid access to poems that contain user query terms or their concepts.
3. **Context-based resource retrieval phase:** A context-based dialogue approach is proposed to find out learners' intentions on the context information. Appropriate search results (e.g., poems and ROs) will be returned by the indexing service for each search request.

Details of each phase will be described in the following sections.

### **Prefetch-based resource information collection phase**

As mentioned above, some of multimedia resources on the World Wide Web are elaborately tailored to help explain or recite a specific poem, and some of which are created to help describe a specific entity (such as people, buildings, or locations) depicted in poems. Accordingly, to collect the information of these resources, a set of keywords is first selected as representative of 300 Chinese poems by consulting a domain expert. The keyword set is used to construct the index (PMRI) in phase 2. In this phase, some of the keywords (e.g., poem title, person's name, building name, and location name) are used as query words to find corresponding ROs on the web by using a meta-crawler. The other keywords are too abstract (e.g., love, farewell, or sad) to find corresponding ROs. During collection, the keyword-matching principle is used to collect each RO's information. Since the ROs could be unavailable or untrustworthy, the Weblink and related information of each RO is fetched and represented as resource context in the Definition of Context Information. Each definition of Context Information (CI) is defined below.

*Definition of Context Information:*

CI=(UC, RC), where:

- UC(User Context) = (resourceType, availability, trust, dueTime)
  - A resourceType denotes the type of a RO, where resourceType  $\in$  {Image, audio, video}.
  - Availability is the probability that users can access the content of multimedia resources, where  $0 \leq \text{availability} \leq 1$ .
  - Trust is the trustworthy degree that a specific multimedia resource can help users become aware of a corresponding poem/entity, where  $0 \leq \text{trust} \leq 1$ .
  - DueTime is a few minutes that students will wait to retrieve the corresponding resources.
- RC(Resource Context)=(tag, resourceType, fileType, fileSize, URL, availability, trust)
  - A tag denotes a term assigned to a RO which helps describe this object and allows it to be found again.
  - A fileType denotes the type of file such as jpeg.
  - fileSize denotes the size of a RO.
  - URL (Uniform Resource Locator) is a specific character string that constitutes a reference to an Internet resource.

If the tags of a RO are matched to two query words in the same poem, the trust value of this RO is set to 0.5. However, the context information of a RO may be modified. For example, the resource repositories may change the inner links to the resources or remove the resources altogether. Accordingly, a boundary condition is set for refreshing the context information. If there are dead links, resources will be collected again.

### **Poetry multimedia resource index construction phase**

The aim of this index (PMRI) is to assist users to access adequate poems and multimedia resources. To construct PMRI, we employ a well-known Chinese vocabulary-indexing thesaurus Tongyici Cilin (TYCCL) (Mei et al., 1984) which is a four-level thesaurus. The semantic meaning of a word in a higher level is more abstract than those in a lower level. Based on their semantics, Chinese vocabularies are classified into different classes. Because of its well-defined structure, TYCCL is reused and two extra levels, "poem" and "resource" are added to construct PMRI.

*Definition of poetry multimedia resource index:*

- PMRI is an extended ontology that consists of seven levels: Root, Category level, Abstract concept level, Concept level, Vocabulary level, Poem level, and Resource level.

Figure 2 illustrates the structure of PMRI. A poem "Seeing Meng Hao-Ran off to Guangling at Yellow Crane Tower" is used as an example displayed in Figure 3. The poem describes the feelings of the poet Li Bai at the Yellow Crane Tower as his friend Meng Hao-Ran leaves. In Figure 2, the three keyword nodes in Level 4, "old friend," "sail," and "Yellow Crane Tower" connect with this poem in Level 5. In Level 6,  $R_1$ ,  $R_A$ , and  $R_V$ , the related ROs, link to this poem. In addition, this study records the usage frequency of concepts in PMRI by noting the number of poems that use this concept. For instance, the node "people" in Level 1 is used in 36 poems ( $n_p = 36$ ).

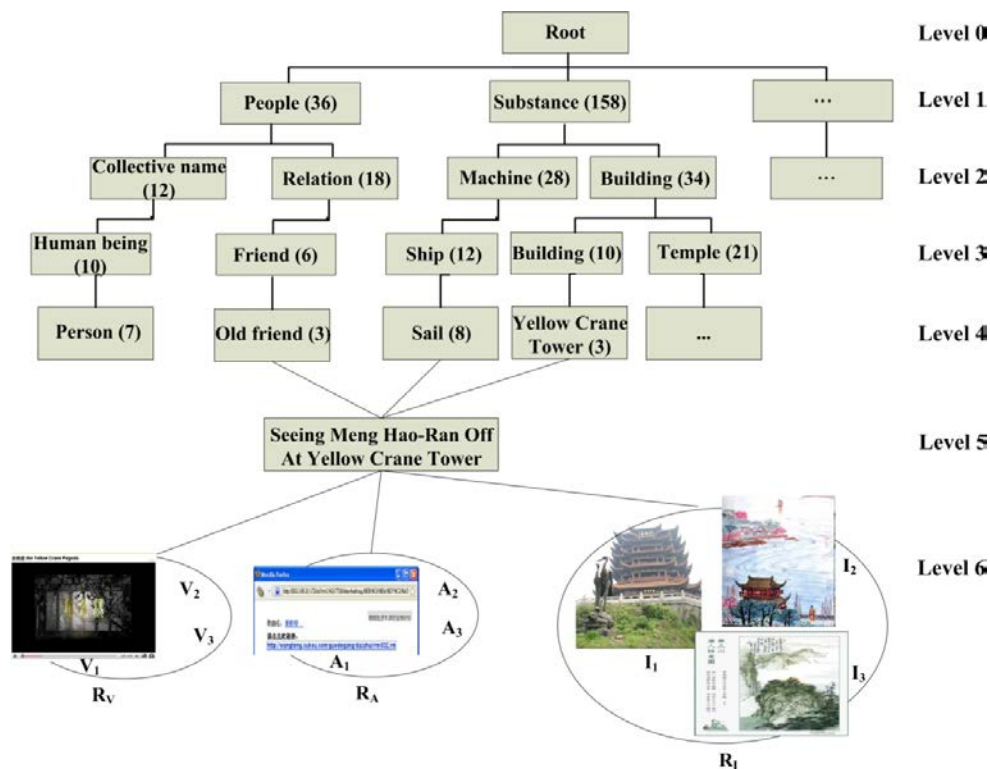


Figure 2. Structure of poetry multimedia resource index

<p>Title: <i>Seeing Meng Hao-Ran off to Guangling at Yellow Crane Tower</i>          Poet: <i>Li Bai</i>          Poem:  <i>My friend has left the west where the Yellow Crane towers;          For Yangzhou blooming in March with red flowers.          His single sail has been lost in the boundless blue sky;          Where I saw the endless Yangtze River rolling by.</i>          (In Chinese)          《黃鶴樓送孟浩然之廣陵》李白          故人西辭黃鶴樓，          煙花三月下揚州。          孤帆遠影碧空盡，          惟見長江天際流。</p>
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Figure 3. Illustrative example of a Chinese poem

The construction of PMRI starts from the vocabulary-indexing thesaurus TYCCL. Since the resources already link to the poems in the phase of prefetch-based resource information collection, the construction mechanism focuses on the connection between poems and TYCCL. First, these keywords, except poem titles and authors, are matched to the thesaurus entries (the Vocabulary level in TYCCL). Those which do not match the entries are unknown words. The head noun heuristic, such as the one below, is used to deal with this problem.

*Heuristic of head noun:*

- A head noun is the main noun that is modified by other elements (modifiers) in a noun phrase. In Chinese, the head noun occurs at the end of a noun phrase (Liang & Wu, 2009).

In a noun phrase, the head noun could be the last three-character word, the last two-character word, or the last one-character word. For example, the head noun of an unknown word “abcde” could be “cde,” “de,” or “e.” The long-term priority is adopted for this heuristic; therefore, the last three-character word is assigned the highest priority. After using this heuristic, unknown words are tagged with their senses and stored in PMRI.

### Context-based resource retrieval phase

The purpose of this system is to support situated poetry learning under a teacher's guidance. In addition, this system can also support individual learning. For group learning, a teacher uses the user interface to set presentation poems before starting the class and then students learn the prepared poems. For individual learning, students can learn any poem by using the function of poem recommendation.

To assist students with identifying their intentions about user context, we propose a context-based dialogue approach to interact with students. The context-based dialogue for intention finding includes two parts: poem recommendation and multimedia resource retrieval. In terms of poem recommendation, PMRI ontology traversal approach (e.g., listing a specific term's hyponyms) is provided to interact with users to find their intentions regarding the dramatic situations of poems. For reducing the options during dialogue, a higher usage concept heuristic is used as below. Example 1 shows an example of the dialogue process for poems.

#### *Heuristic of higher usage concept*

- A higher usage concept denotes a concept used frequently in the poems, which can be used to guide students to select suitable keywords as their intentions. If the  $n_p$  of the concept node in PMRI is higher than the threshold, the concept will become one of the options during dialogue.

#### **Example 1: Dialogue process for poems**

This example illustrates the dialogue about a student's intentions for poems.

Q: Which subject do you want to describe (*people, human affairs, or substance*)?

A: People.

Q: Which about people interests you (*identity, relation, or career*)?

A: Relation.

Q: Which subject within "relation" interests you (*friend, classmate, or master*)?

A: Friend.

Q: Which subject within "friend" interests you (*intimate, acquaintance, or old friend*)?

A: Old friend.

To gauge the similarities between the student's intentions and the poems, this study uses the cosine function, used to measure common similarities. The following defines the similarity comparison.

$$\text{Similarity} = \text{cosine}(V_A, V_B) = \frac{V_A \bullet V_B}{|V_A| |V_B|}$$

$V_A$  and  $V_B$  are the keyword vectors, which represent the student's intentions and the poem's representative, respectively. The larger the value is, the more similar the two vectors are.

In terms of multimedia resource retrieval, individual student can set his/her tolerance degree regarding speed of resource presence, degree of availability, and degree of trust in advance. Then, if these values of ROs fit in with the values of students' preference (e.g., response time of RO is smaller than acceptable due time,  $T_{\text{Response}} < T_{\text{Due}}$ ), the different types of ROs are ranked and presented based on trust. The definition of response time and bandwidth is defined below. Example 2 shows an example of the dialogue process for ROs. Example 3 shows an example of multimedia resource retrieval.

#### *Definition of Response time:*

- This study applies response time to evaluate the length of time a Web site will take to present a resource based on its file size and bandwidth.

$$T_{\text{Response}} = \frac{\text{FileSize}}{\text{Bandwidth}}$$

#### *Definition of Bandwidth:*

- Bandwidth is a data transfer rate for the amount of data that can be carried from one point to another in a given

time period. Bandwidth is measured in bits (of data) per second (bps).

$$\text{Bandwidth} = \frac{\text{FixedFileSize}}{\text{Transfertime}}$$

### Example 2: Dialogue process for resources

This example illustrates the dialogue about a student's intentions for multimedia resources.

Q: What kinds of resource types do you prefer (image, audio, video)?

A: image, video.

Q: Please set the value of availability. (Default: 1)

A: 1.

Q: Please set the value of trust. (Default: 1)

A: 1.

Q: Please set the value of due time. (Default: 1 min)

A: 1.

### Example 3: Multimedia resource retrieval



Figure 4. Multimedia resource retrieval for Yellow Crane Tower

As Example 1 shows, the intention is “old friend.” The overall intentions of the student are: “old friend, farewell, river, and sad.” Then, this system computes the similarity degree between the learner's intentions and keyword set of poems and recommends several poems, such as Seeing Meng Hao-Ran off to Guangling at Yellow Crane Tower (Poet: Li Bai), A farewell to a friend (Poet: Li Bai), and Farewell (Poet: Wang Wei). Ultimately, the student chooses to learn Seeing Meng Hao-Ran off to Guangling at Yellow Crane Tower and then multimedia resources related to this poem are pre-selected. As shown in Example 2, the student's intentions of multimedia resource are acquired and then some of the pre-selected multimedia resources will be filtered. Figure 4 shows a snapshot of the retrieval of the appropriate multimedia resources based on the student's intentions.

## Experiment and analysis

The UPLS was implemented on a Microsoft Windows Mobile Operating System (OS) platform and JSP Web application. The UPLS contains a user model and an activity model (Griffiths et al., 1998). The user model is used to store the features of users, which includes user profile and group user profile. Regarding the activity model, it is used to provide learning activity for learners, and collect learners' access data.

## Teaching preparation

For instructing students on farewell poems, the participant teacher decided to use situated learning in an attempt to stimulate the students' interest in learning this particular type of poems. Before starting the class, the teacher used a desktop computer to design a learning activity. When the teacher participant selected 3 farewell poems from 300 poems as learning materials (e.g., Seeing Meng Hao-Ran off to Guangling at Yellow Crane Tower, A farewell to a friend, and Farewell), related ROs with the selected poems are presented. To offer trustworthy ROs for learners, the teacher browsed related ROs and rated some of them as trustworthy ROs (Sun & Cheng, 2007).

## Learning material

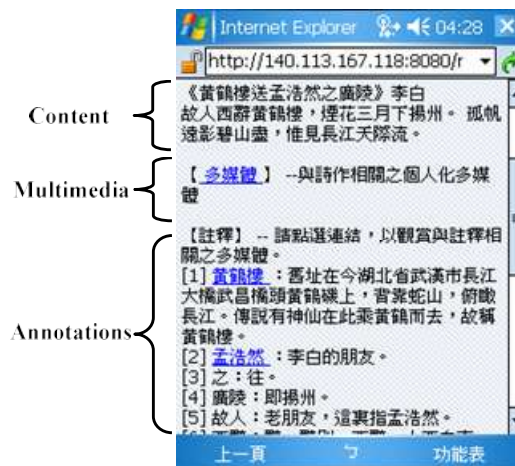


Figure 5. Illustrative example of the learning content

After successful login, students can setup their preferences and see the teacher prepared poems. The learning material offered in this study is shown in Figure 5 and Figure 6. Figure 5 depicts the learning content of a farewell poem, Seeing Meng Hao-Ran off to Guangling at Yellow Crane Tower, which presents poem content, annotations, explanation, and multimedia resources. In Figure 5, learners can click the link of multimedia resource to browse all of the collected resources which relate to this poem. Those multimedia resources are retrieved based on user intentions. As for Figure 6, the student can click one of the annotation links to browse its multimedia resources which also correspond to user intentions. For example, a student clicks “Yellow Crane Tower” to see what the building looks like and what image the poet may have envisioned.



Figure 6. Illustrative example of the resources about annotation



## Participants and experimental procedure

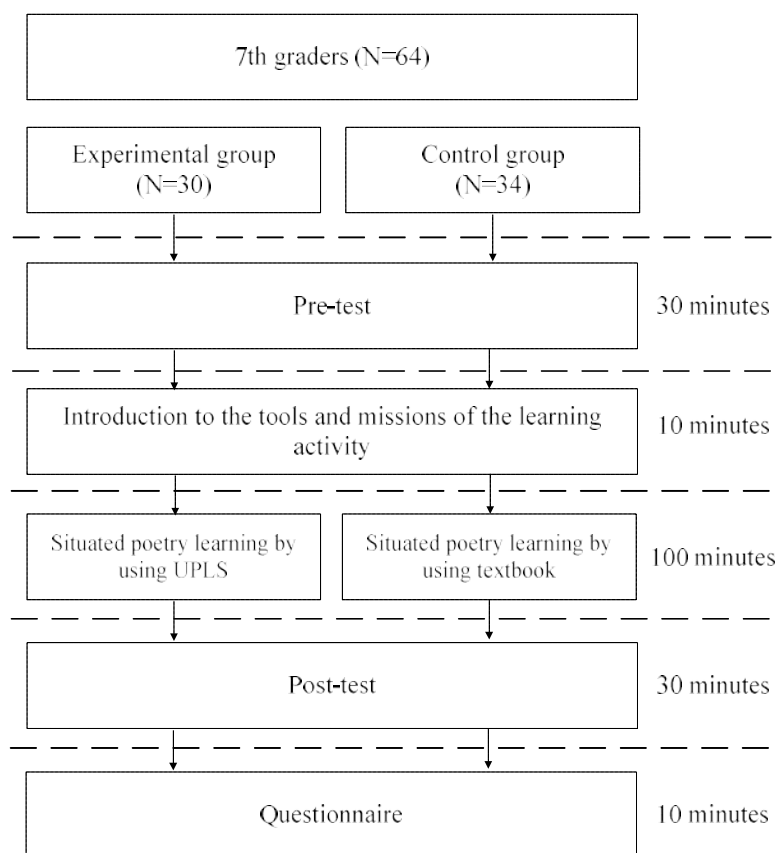


Figure 7. Experimental procedure

The participants were 64 native Chinese speaking seventh grade students from two classes. One class was assigned to be the experimental group (N = 30), and the other class was the control group (N = 34). The students in the experimental group were instructed and guided to participate in the situated learning activity by using UPLS (with multimedia resources), while those in the control group were instructed and guided to participate in the activity by using conventional approach (without multimedia resources). Note that all participants received the same treatment such as instruction, learning materials (e.g., poem contents, annotations, and explanations), and environment.

The procedure of the experiment is presented in Figure 7. The total length of the experiment was 180 minutes. Before the beginning of class, all of the students took a 30-minute pre-test which was used to gauge the students' existing knowledge of Chinese poetry. Then, the experimental group received a 10-minute instruction on the procedure and operation of the PDA. During the next 100 minutes, the experimental group adopts situated poetry learning by using PDAs with wireless communication as learning tools to browse this system. The control group adopts situated poetry learning by using textbooks as the primary learning tools. After the learning activity, all participants took a post-test and the students in the experimental group filled out a learning satisfaction questionnaire to measure their degree of satisfaction toward this system. The total time for this was 40 minutes.

## Measuring tools

The pre-test was conducted to evaluate the students' prior knowledge before learning the poems. It consisted of ten true-false questions and fifteen multiple-choice questions, giving a total score of 100. The post-test aimed to evaluate the learning achievements of the students after learning the poems. It consisted of 25 multiple-choice questions, with a total score of 100.

A questionnaire was developed to evaluate students' learning experience with the system developed in this study. A five-point Likert scale was used ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was composed of three constructs, including the learning effects of situated learning and multimedia, satisfaction of the presented results, and satisfaction of this system. The questionnaire contained a total of 11 items, including three items related to the effects of situated learning and multimedia on learning, three related to satisfaction of the presented results, and the remaining five related to satisfaction of this system. During this questionnaire design process, the questions were verified and validated by domain experts. The researchers utilized Cronbach's alpha analysis to evaluate the internal consistency of this questionnaire. The Cronbach  $\alpha$  value in each question is higher than 0.70 (total Cronbach  $\alpha$  value = 0.8252). This implies all questions can be retained and the reliability of this questionnaire is sufficiently high.

### Analysis of learning achievements

For the prior knowledge of the two groups before the experiment, the mean scores of the pretest are 66.90 and 64.82 for the experimental group and the control group respectively, as shown in Table 1. According to the *t*-test result, no significant difference is found between the two groups; implying that the two groups of students had equivalent base knowledge before participating in this learning activity.

Table 1. *t*-test result on the pre-test scores of the two groups

Group	N	Mean	S.D.	<i>t</i>
Experimental group	30	66.90	20.69	.301
Control group	34	64.82	16.35	

For the learning achievements of the two groups after the experiment, the mean score of the experimental group, 82.00, is higher than that of the control group, 71.65. The *t*-test result reveals a significant difference between the two groups, as shown in Table 2. It can be noticed that the situated poetry learning by using UPLS seems to be more effective than the conventional situated poetry learning in promoting the learning achievement of the students.

Table 2. *t*-test result on the post-test scores of the two groups

Group	N	Mean	S.D.	<i>t</i>
Experimental group	30	82.00	10.01	.032**
Control group	34	71.65	16.71	

Note. \* $p < .05$ ; \*\* $p < .01$ .

### Analysis of satisfaction survey

As Table 3 shows, students' attitudes toward the use of this system can be divided into three different dimensions (the learning effects of situated learning and multimedia, satisfaction of the presented results, and satisfaction of this system). The average of the answers for all questions is above 3, implying that most students felt satisfied with the proposed approach.

In terms of the learning effects of situated learning and multimedia, most of students showed positive attitudes toward situated learning and multimedia resources.

In terms of satisfaction of the presented results, most students felt satisfied with the results; implying that students could retrieve their intended multimedia resources and the presented multimedia resources were available and trustworthy. Furthermore, it is interesting to find that students have more interests in images and videos than audios.

In terms of satisfaction of this system, most students felt satisfied with the system. Question 11 is especially high (3.99), and it shows that using this system to learn poems is convenient. The lowest score appeared on question 9, in which students expressed a negative attitude toward the speed of the multimedia resources presentation in the wireless Internet. Compared to question 8, a possible reason for this is that the available bandwidth is fixed, but all participants simultaneously access the multimedia resources. If the teacher divides the participants into several groups, each group has different learning activities, e.g., one group browses poem content, and another group

browses multimedia resources. Fewer participants can simultaneously access the multimedia resources and the bandwidth bottleneck can be alleviated.

Table 3. The result of questionnaire

#	Questions	Mean	S.D.
<i>The effects of situated learning and multimedia on learning</i>			
1.	Situated learning is more interesting than conventional learning.	3.94	1.01
2.	I think using text and multimedia resources to learn poems could increase my learning motivation.	3.70	0.97
3.	I think poems can be easily understood by using multimedia resources.	3.67	0.88
<i>Satisfaction of the presented results</i>			
4.	I am satisfied with the presented images.	3.64	0.92
5.	I am satisfied with the presented videos.	3.70	1.00
6.	I am satisfied with the presented audios.	3.54	0.88
<i>Satisfaction of this system</i>			
7.	This system is easy to understand and operate.	3.88	0.90
8.	I am satisfied with the speed of this system.	3.70	1.02
9.	I am satisfied with the speed of the multimedia resources presentation.	3.22	1.04
10.	It is interesting to learn poems by using this system.	3.82	0.90
11.	It is convenient to learn poems by using this system.	3.99	0.90

From the teacher interview, it was found that the teacher participant showed a positive attitude toward this system. The opinions are summarized as follows.

Since Chinese poems are filled with imagination and abstract concept in a limited number of Chinese characters, people are not easy to understand their meanings. For example, a scenario “the withered vine, old tree, crows at dusk ...” described in a famous Chinese poem “To The Tune Of Tian Jing Sha (天淨沙).” “Autumn Thought (秋思)” are abstract. In the Web 2.0 era, many multimedia resources about poems can be found from the Internet. Some audio clips recorded the recitation of a specific poem, which may arouse students’ learning interests. Some video clips were designed to help explain a specific poem, and images can be used to help illustrate the meanings of a specific poem. Through related multimedia resources, students can not only be aroused their interests, but also see the concrete images to experience and imagine the scenario what the poet may have envisioned. Then, students can understand the rich meanings in the poems. With the aid of resources retrieved from World Wide Web, teaching and learning Chinese poetry become much easier and much effective. Instructors can use Web 2.0 technology to help students learn. Students can learn poems better and appreciate the beauty of poems deeper, especially for those whose learning style is visual or auditory.

However, collecting related multimedia resources about Chinese poetry is a time-consuming and labor intensive process. This study proposes a promising way for teachers and students to collect useful multimedia resources from internet and construct an index to retrieve both of poems and multimedia resources.

In terms of teaching preparation, this system is easy and simple to setup learning activity. By using PMRI ontology traversal approach, the intended poems can be found out easily and then corresponding multimedia resources were presented. During the preparation process, the teacher took around half an hour to select poems and trustworthy resources.

The teacher held a positive attitude about this m-learning mechanism. This approach could also adapt to each child’s individual learning progress and condition. With portable learning devices, students could manipulate the learning process and learning speed on their own. Through the use of this technology, students have become more active participants in the learning process.

In addition, the teacher also suggested that each resource can have its own small representative image before students click on them. With the aid of miniatures, students can quickly select the intended resource.

## Discussions

As the rapid development of computer and Internet technologies, there are many e-learning platforms such as Moodle. In such platforms, multimedia instructional materials have been shown to attract learner's attention and interests (Cai, 2003; Chen, 2008; Lo et al., 1999; Sun & Cheng, 2007). Researchers have also shown the benefits of using this kind of platforms as teaching tools (Martín-Blas & Serrano-Fernández, 2009). However, teachers need to upload files to the platforms for course use. Compared to the existing e-learning platforms, the proposed UPLS automatically collects the information of relevant multimedia resources, stores the resulting index of words, compares search query to the index and recommends relevant learning materials.

Previous studies suggested the effectiveness of learning in a situated learning environment (Brown et al., 1989; Herrington & Oliver, 1999; Horz et al., 2009; Hwang et al., 2011). Owing to the popularity of portable devices (e.g., PDAs and smartphones) and wireless communication, the potential of mobile learning or one-to-one learning has been noted (Chan et al., 2006). Several researches have reported the benefit of using mobile technologies in supporting situated learning (Hwang, Hung, & Lin, 2010; Liu, Peng, Wu, & Lin, 2009; Shih et al., 2012). Herrington and Oliver (1999) also stated the benefit of using an interactive multimedia program based on the situated learning. In addition, the integration of situated learning into Chinese poetry instruction can promote students' learning motivation (Chen, 2008; Shih et al., 2012; Su, 2007). These findings show the value of investigating the possibilities of using multimedia resources to support situated poetry learning.

As in Shih et al. (2012), students use smart phones to record, accumulate, organize and share their feelings related to poems by photos while learning Chinese poetry outdoors. An increasing number of multimedia resources are available via the World Wide Web. However, online multimedia resources could be unavailable, delayed or untrustworthy, which may not result in significant positive learning performance (Sun & Cheng, 2007). In this study, new criteria were proposed to assist users in retrieving personalized and appropriate learning resources. To achieve this aim, the collected multimedia resources were represented by sets of metadata in the resource context (such as trust) and then appropriate learning resources could be retrieved based on learners' intentions.

As a result, the experiment results show that the offered multimedia instructional materials effectively help students improve their learning achievement; implying that the presented multimedia resources were available and trustworthy. In terms of students' attitudes, most student participants showed positive attitudes toward situated learning, multimedia learning, the presented multimedia resources and this system; implying that the students could retrieve multimedia resources based on their individual requirements and they were satisfied with the presented multimedia resources in a situated learning environment. In terms of teacher attitude, the teacher participant showed a positive attitude toward using this system as a teaching tool. From the teacher interview, it was found that the teacher participant can quickly design and facilitate engaging learning activities; implying that UPLS as well as the index (PMRI) is suitable and efficient.

Although the experimental results have shown the benefits of using UPLS, there are some limitations in the present study. For example, in order to offer high rich media, teachers need to rate the collected multimedia resources before starting the class. Therefore, two of our future works are to consider trusted users and content adaptation. Some bloggers/Web sites are famous and people trust the materials or articles provided by them. The resources they offer should be trustworthy. In addition, with content adaptation, different content can be transformed to adapt to any mobile device that can provide the best viewing experience for learners.

## Conclusion

Due to the popularity of portable devices, learning anytime, anywhere, and any place is feasible. M-learning offers learners access to learning resources by using handheld devices with wireless communication in an authentic learning environment. In this study, teachers can easily setup this system as a learning tool and encourage student participation in using this system to learn poems. While learning, students can retrieve poems and adequate multimedia resources based on their context information. To evaluate the effectiveness of this approach, an experiment was conducted which compared the learning achievements of the students who learned with the UPLS and those who learned with conventional situated learning approach. The experimental results showed that with the help of the UPLS, the learning achievement of the students was significantly better than for those who learned with

the other approach. Meanwhile, the analysis of the questionnaire results showed that most students felt satisfied with the proposed learning approach. The teacher participant showed a positive attitude toward this system.

## Acknowledgments

This work was partially supported by National Science Council of the Republic of China under Grant No. NSC 98-2511-S-468-004-MY3, NSC 100-2511-S-468 -002, and NSC99-2221-E-009-130-MY2.

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