Development of RFID English Learning Supporting System for Elementary School Students in Taiwan

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***Abstract*- This study integrated situated learning strategies, Radio Frequency Identification (RFID) technology and handheld device (PDA) works with fifth grade English teachers to develop an English learning supporting system. The results show that fifth grade students are highly satisfied by this system and they also agree the system which is good for their English learning. Moreover, the higher positive learning attitude students perform better than others and the students have higher satisfaction also perform better in achievement score.**

I. INTRODUCTION

With the advent of global village, frequent contacts for International Affairs, English has become the most important communication tool for everyone. In order to accelerate the "internationalization" of Taiwan, from the Government, schools, private operators to the family, "English education" has become the focal point for the education competence. From 2010, the Executive Council of economic invested 600 million dollars planned through the research and development of "construction of English force upgrade program" such as construction English village, and to replace government agencies bilingual labeling (road sign, door tag, etc) requirements for various ministries to upgrade the environment setting. From 2010 to 2013, 200 million dollars funded, full promotion of six large upgrade international competitiveness policy will be working on, including: promote implementation English marked, and built reset English village, English situation field domain, and investment internationalization professional talent, and strengthening international life in to service, and accelerated promote international life environment, and upgrade city international competitiveness.

Currently using English situation center work with elementary school English field teaching has gradually become mainstream. However, how to establish an expedient of learning situation? How to integrate instructional design, learning strategies and digital technology application in English teaching? In recent years, the researches of using technology support situation learning have become quite popular in Taiwan, but the related research topics mainly focused on outdoor ecological curriculum [1], [2], [3], but lack of design for language teaching system related projects. Also because of different subject matters, the previous mentioned research questions remain to be further clarified and confirmed.

Therefore, this study works with fifth grade English teachers and selected "directions" as the learning theme. Integrating situated learning strategies and Radio Frequency Identification (RFID) technology, this study developed a situation type teaching system by using handheld device for elementary English teaching and learning. Through role play, solve the problem, and group interaction learning strategies, this program tried to encourage students ' English learning motivation and enhance student interest in learning and success, and provide some good input for the future system modification.

II. RELATED STUDIES

RFID (Radio Frequency Identification)

With the rapid development of information technology and network infrastructure, development of digital learning mode of operation has rendering multiple appearances. Wireless network technology and handheld device (mobile phone, PDA, Tablet PC) have also driven the development of mobile learning [4]. Wireless network omnipresent ability allows the handheld device to download content anytime, anywhere, extends tentacles to make learning outside the classroom and make learning more realistic situation.

Due to the ubiquitous facilitating performance of mobile learning and interactive link has close to the real world, if the learning setting can be real life situations and closely related to the learner classroom, learning will be not only interesting, more learning motivation and practical. Schilit and Theimer [5] first invented the term context aware technology, initially of defined for entered situation and adaptation new of situation (adapting to context), and subsequently began has different interpretation appears, such as adaptive, reactive, and responsive, situated, and environment directed. Dey and Abowd [6] defined it as "a system is context-aware if it uses context to provide relevant information and/or services to the user, where relevancy depends on the user's task".

While definitions of context aware gradually clarified and the technology has more mature, the enlarged real world environment can provide the most suitable learning contents to make learning safe and improve learning results. In many of the related technology, radio frequency identification (RFID) is one of them.

The concept and application of radio frequency identification (RFID) technology

Radio frequency identification (RFID) is a simple concept. It has great features, using automatic identification technology in radio frequency to identify objects. RFID Reader emits radio waves, using contactless way to read implantation or affixed to the electronic label (Tag) on an object, then for wireless identification and data capture [7].

Radio frequency identification technology itself is not an emerging technology, but the applications mainly for use within the enterprise mode of the past. In a sealed environment, using RFID device to collected data, once a product is stuck an electronic tag, computer program can read it of existing. If in the warehouse, all products are posted electronic tags, no longer needs the time-consuming inventory work, not longer has lost or errors, and also no longer has transported errors.

RFID is a tiny electronic tag attached to articles, RFID sensors by radio frequency identification technology to the electronic tags, so the RFID system consists of electronic tags and sensors. In addition to the electronic label small IC, there is a very important component, namely the antenna. Therefore, the composition of the three main RFID components are:

Tag: Chinese are widely translated into electronic tags, or RFID transponders have been used device (RFID Transponder), non-contact ID tags (Contactless ID Tag) and other names. But in general we are often known as Tag and tag antenna, in principle, Tag is an electronic card that we commonly known as the IC.

Antenna: tag line on the circle is the circle around the antenna, the antenna used for transmission of electronic tags and radio frequency signals between sensors, wireless communication function has been reached.

Reader: commonly known as the sensor, or reader, reading machines. Sensors used to read electronic tags, the use of radio frequency signals, so no contacts with the electronic tags can be read and the sensor can be connected to the computer, the information will be sent to the system side for identification or follow-up treatment. Types of sensors can be divided into read and write both, types of handheld, gate-channel type and so on

RFID system is mainly composed of reader, the electronic label (Tag), the application system and database [8], [9]. Through the reader sends radio frequency signal detection, issued by means of radio frequency to set the electronic label, and receives wireless electronic label reflecting back. Then return to radio frequency identification of encoding information are carried by and transferred to database (Fig 1).

As mentioned previously, context aware technology is highly accepted in education, while makes RFID also gradually boom up in educational technology. Literature review showed that RFID technology related studies are still mainly in industry field but about education of application aspects is still developing. Literature review also shows that the search integrating RFID technology in education, Taiwanese scholars are very strong in the very aspect.

Liu, Tan and Chu [10], using of RFID building ubiquitous learning environment, to assist fifth grade outdoor courses in natural sciences. Tseng, Hsu and Hwang [11], studying on ubiquitous platform for collaborative learning, application of RFID technology to help university students an introduction to the computer. Huang, Hsu and Cheng [12] using the advantage of RFID to integrate library courses into real-world situations, create a silent game in the library to enhance student motivation. Horng, Horng and Sun [13] use mobile devices with RFID in vocational education and training. The topics covered a wide range, but most for natural science outdoor observation, or interaction with the field. However, language learning and related issues are rare. Ogata and Yano [7], [14] using RFID built environment, due to equip learners with honorifics in Japanese, is one of the few relevant examples of foreign language learning.

Induction from previous researches and actual needs of teaching field, this research attended to integrate situated learning strategies and RFID technology to match the fifth grade of English instruction and develop a mobile learning system. Hopefully, taking advantage of fun, convenience and information technology of this system, not only can upgrade the learning motivation and learning effectiveness of students, also collected the learning portfolio which provides teachers individual information for assisting, and gives the system and foreign language teaching some important recommendations.

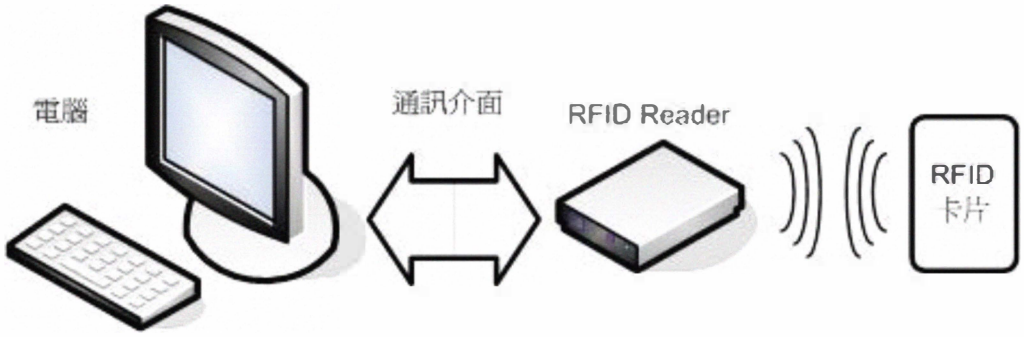


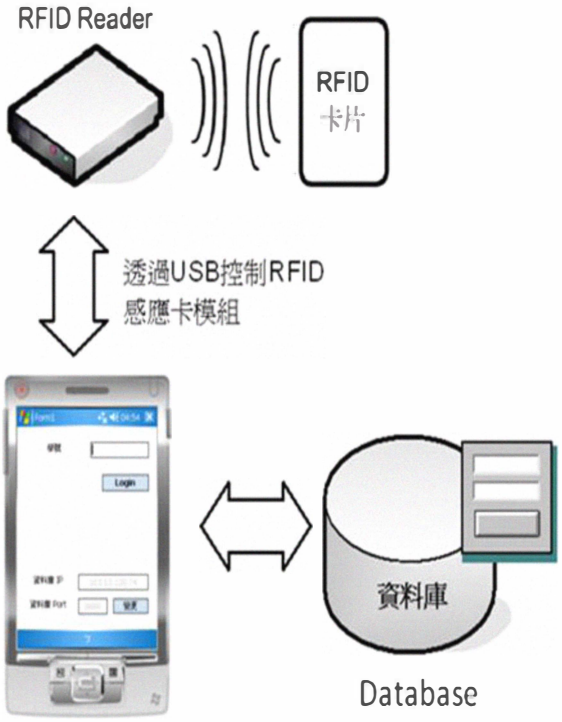
Fig 1 Schematic diagram of the operation of RFID systems

III. System Design

According to the literature the characteristics of interactive teaching is student-centered activities designed to communicate in real situations and friendly, providing task-based learning activities to stimulate learning motivation of students to communicate with a variety of learning activities students complete tasks and ability to communicate. The task type is referred to the topic and each must answer to a course of action.

System architecture is divided into four main areas, 1. electronic tags - Card (Tag), 2. sensor-RFID reader module (Reader), 3. application (Application) and 4. The database (Database). Sent by the wireless radio frequency signals to the reader to start to detect, within a fixed distance, by radio frequency to the set of electronic tags, radio frequency electronic tags, after reflection, the electronic tags to identify the specific coding information, and send to the rear Side of the system database. Early first consider the feasibility of the system and success of research and development, it is expected that use of master-slave architecture to set up this system, the hardware, we use a computer, equipped with RFID readers, students view the computer as a tool.

Meet the needs of electronic tags to set the system, and suspension or paste in the location or subject matter on the subject. Topics by students in accordance with the instructions indicated, move to the specified location, use RFID reader on the corresponding position sensor tag, the reader will return the answer, and other students to complete all the instructions, get all the English words ask students Enter the initial letter of each word as the key password, enter the time and then will test the record of right or wrong to return the database.



In the interactive teaching concept, hoping to bring the students for a number of situations, and when students encounter problems, provide solutions, to allow teachers who have flexibility in the use of alternative, students can also provide a wide range of practice and learning. Whether or hearing problems word problems have to help [Help] button, can provide further hints to the learner, to help learners to confirm the answer. Word problems can press the button, hear the sentence. Hearing problems can also press the button to show the sentence.

Part of the database is divided into two parts, a database for students, two for the learning database. Part of the database of students, is to record each student's basic information and answer the test length of time spent with the number of right or wrong. The part of the learning database, it is subject teachers can enter and answers, the future can also add, delete, modify, and query functions. Fig 2 shows the system architecture.

IV. Experiment

System wide in a special classroom use, teachers can configure their own position belongs to the first electronic tags, the students on an individual basis, the implementation of the system into the classroom after the login screen will pop up, ask each student to student number as the registration Into account, and then jumped into the main screen, and the current context of game design and test models for the practice mode.

Free to choose to practice or test mode, each mode are in accordance with the position from the classroom in the middle of the beginning, the title will be a question in English mainly directed to students. In the subject design, we hope that students at all induction points to get the English word and the last answer to be combined into the English word (that is the answer), to have relevance, for example: students beginning to the middle sensor point of access to forward position information, get North (please go north), go north of students to advance to the north of the sensor points to get the English word Apple (Apple) and must go back to the middle of the sensor point of access to information under the direction of a forward. And so on, we get the Net (net) and Tree (tree), the two English words, we get three English words at the beginning of this letter A, N, T, after these few English words as the key code to type (Key-in) way to enter the system, it can be strung together to tell a story to display a picture on top end up spider web under the apple tree, a group of ants slowly climb. If the key code in the collection process, the students do not understand the English sentence means the case, you can press the help [Help] button to the form of listening or reading to help students judge. Students to answer during the final statistics of time spent, and the correct answer rate.

Practice mode mainly to enhance students practice the language, or hearing, each practice will be for students to do right or wrong answer to the right until the answer correct.

Test mode will record students is the key to the final code to the right or wrong, right and wrong times, and duration of each test will be recorded in the student data library for teachers to observe and score.

Back-end platform for teachers, teacher side as far as possible in order to streamline the interface design considerations do not want every teacher to use the platform to spend too much time, do not even have the system's advanced operating depth understanding and reduce the use of teachers Burden. Teachers can also choose the topic and the degree of difficulty, set the desired type of program being stored in the database, you can re-use can also be amended to observe each student's test results. The system uses RFID to design the main purpose is to allow students to learn English through the action personally involved in the environment, so the design will not be too complicated topic, reading and listening to the main stage.

V. RESEARCH FINDINGS

Satisfaction of English learning system satisfaction

After English learning system for context-aware test, 22 students fill out a questionnaire of satisfaction, and descriptive statistics and independent sample t test analysis are reported. The questionnaire scoring by using four points Likert Scale and total 25 questions. The answer "very agreed" is 4 points; answer "agreed" is 3 points; answer "not agreed" is 2 points; answer "very not agreed" is l point. The higher the total point represents the higher satisfaction to the system.

Full score is 100, the average score is 73.1 points. Except question 5 and 14, others are more than 3 points which shows the overall student satisfaction with this English learning system is high (Table 1).

Independent sample t test and examine the satisfaction of differences between male and female found higher overall satisfaction, no significant difference (t.>.05), expressed satisfaction no significant differences between male and female.

Question 5 is "I like [Help] press, can let I repeat heard", and the average is 2.45, shows that students most not like to use [Help] key to help them answer. Question 14 asked students about the difficulty or easy level of the questions.

It is a reverse questions, average score is 2.64 which shows students general think questions are not simple. However, male and female in question 14 has significantly differences p=.01 (t<.05), shows girls think the questions quite easier that boys (Table 2).

TABLE 1
Descriptive statistics

Question Item	Gender	Ave.	Mean
5. I like [Help] press, can let I repeat heard	M	2.69	1.37
	F	2.11	1.05
14.I think the questions are too easy	M	2.15	1.06
	F	3.33	0.86

Analysis of achievement, attitudes and satisfaction

Single factor analysis of variance (One-way ANOVA), the boys time to complete the task (118.77) is significantly more than girls (M=81.1), 0.024 (p<0.05). In face the significant differences in average scores between men and women, and the performance of girls is better than boys, this results reflecting attitudes questionnaire, boys have lower learning attitude than girls on English learning (Table 3, 4).

To probe into the Pearson correlation learning attitude and performance, the result is significant Sig.=.019 (<0.05), shows the learning attitude is positively related to learning performance. 0.443(0.7> R>0.4) represents the moderate positive and shows students ' learning attitude higher, the performance is better (Table 5).

Furthermore, the Pearson correlation study on correlation of performance and satisfaction, found between high positive correlation (R=0.73>0.7,Sig.=0<0.01), that represents the higher the scores, the higher the satisfaction (Table 6).

TABLE 3
Performance (Completed time) Descriptive statistics

	N	Ave.	SD	SE	Min	Max
M	13	118.77	42.95	11.91	68	225
F	9	81.11	19.90	6.63	45	117
Total	22	103.36	39.54	8.43	45	225

TABLE 4
Performance (Completed time) One-way ANOVA

	SS	df	MS	F	Sig.
BG	7541.89	1	7541.89	5.961	.024*
WG	25305.19	20	1265.26		
Total	32847.09	21			

*p<.05

TABLE 5
The correlation between the learning attitude and learning performance

		result	total
Pearson Correlation	result	1.000	.443
	total	.443	1.000
Sig. (1-tailed)	result		.019*
	total	.019*	
N	result	22	22
	rotal	22	22

*p<.05

TABLE 2
Independent sample t test

		Lavene test		t-test for Equality of Means	
		F	Sig.	t	Sig.(2 tails)
5. I like [Help] press, can let I repeat heard	Equality assumed	3.93	0.61	1.06	.29
	Not assumed			1.12	.27
14. I think the questions are too easy	Equality assumed	0.14	0.71	-2.74	.013*
	Not assumed			-2.81	.01

*p<.05

VI. CONCLUSION

In recent years, research on application of RFID technology in learning is thriving and related technique is quite mature, but the foreign language instruction and related researches have to be working on. This system works with elementary school English teachers to meet the needs of situational learning into English teaching and the characteristics of RFID technology. This system takes the knowledge of students ' learning process and motivation to offer teachers real guidance direction to help students, and also able to provide self-learning and students clearly understand advantages and disadvantages. Hopefully, through this research can get the best information in the actual situation, and improve elementary English learning results.

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TABLE 6
The correlation between the satisfaction and learning performance

		result	total
Pearson Correlation	result	1.0000	.733
	total	.733	1.000
Sig. (1-tailed)	result		.000**
	total	.000**	
N	result	22	22
	rotal	22	22

**p<0.01