 

# Integration of Situated Learning and Context Awareness System for Learning Basic Chinese

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***Abstract*—Chinese has become the world's strongest language, and that has also set off a learning trend. It is critical to know how to improve teaching methods and strategies to effectively help non-native speakers to overcome the language barrier. With the Internet's and e-Learning's popularity, learning technologies have led both learning activities and the environment into a multi-dimensional world. Recently a new trend has emerged, called context-aware technology, for developing a ubiquitous learning environment with features that emphasize real life learning situations and problem solving practices. This study has integrated situated learning strategies and context awareness technology to develop a basic Chinese language learning system for exchange students at a large university in northern Taiwan. The pilot test results show that these students are highly satisfied with the system and their learning attitude was also positive, while using this system.**

***Index Terms*—context awareness; situated learning; chinese language learning; RFID**

## I. INTRODUCTION

The emergence of modern China led to international economic growth and competition in global trade. As a result, Chinese has become the world's strongest language in recent years, and has also set off a worldwide learning trend. Acquiring the language is quickly becoming a priority for many. This global boom is traceable. From 1990 on, Chinese has become the second most spoken language after English. Currently there are around 100 countries and more than 2500 universities worldwide that offer Chinese language courses that are being attended by more than 30 million people. In 2010, these numbers were forecast to exceed 100 million. [1]

According to KryssTal's web site [2] Chinese is the most popular language in the world, with about 1.12 billion daily users. English is in second place, with about 510 million. Data from Taiwan's Ministry of Education [3] shows that the number of international students who learn Chinese in Taiwan is increasing. In 2006, 13 thousand people came to Taiwan to learn the language. By 2007, this number had reached 15 thousand, and in 2009, the number exceeded 16 thousand. The need to acquire the Chinese language has obviously increased, year by year. Predictably, this phenomenon is not short-term, and the number of people learning Chinese will become increasingly significant.

Chinese is one of the most difficult languages. For foreigners learning Chinese as a second language, a very important issue is the improvement of teaching methods and strategies to break through the language learning barriers. Ye [4] indicated several characteristics for learning Chinese as a second language: in the classroom, students become bored, are low achievers, lack motivation, and so on. A good second language culture should completely immerse students into the language environment, and mastery of a language should rely on the influence of surrounding environments. Learning a language requires interaction with others. Because of cultural differences, students often cannot really understand the vocabulary and that increases the degree of learning difficulty. When teaching about different objects, the instruction should be well designed. But first one has to understand the students' learning styles and learning context in order to build up a system and employ proper materials for ease of learning. Moreover, students should be able to apply exercises, interactive games and activities to real life situations and connect these to their prior knowledge.

Consequently, future teaching needs to be practical and diverse. How can teaching the language improve? How can various strategies improve the effectiveness of teaching and learning? How can new technology be applied in teaching and learning the Chinese language? These are very critical issues that need to be investigated and discussed.

Teaching and the learning environment have undergone a revolutionary change thanks to the popularity of the Internet and the development of e-Learning models. Teaching methods are extremely diverse. In recent years, the Chinese


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language has been taught using a combination of multimedia and Internet teaching methods that can not only solve the problem of inter-regional gaps, but also provide a wide variety of strategies. Mobile technology is one of these.

Introducing mobile technology into teaching is an important factor in improving learning effectiveness. The convenience, expediency and immediacy of mobile technology allow students to learn outdoors, away from the classroom. [5] For its in-school project: the "new digital experience in e-campus", the North County village's elementary school in new Taipei City built an informational database for plants, on their campus. Therefore during natural science courses, students, through wireless transmissions and PDAs (Personal Digital Assistants), can obtain information about plants with feedback from the surrounding environment, and apply such useful knowledge to real life situations. [6] More and more mobile learning technologies are being used for such outdoor ecological studies, as observing butterflies or birds. [7] Students can be immediately provided with a real understanding of the context. Students are not only involved in a high degree of realism, but need to interact with the actual situation. In such a learning environment, students can build up useful knowledge in a very effective way. Also, using cutting edge technology can augment the lack of interaction with real situations within traditional learning environments. [8]

As mentioned above, a situation learning strategy is also critical when learning a language. Therefore, this study introduces a context awareness concept into the scenario-based learning environment. Students can use a handheld device (or PDA) for self-learning, practice or testing their basic language skills. In such a context environment, students can be increasingly provided with the necessary "interaction" in language learning. Through the computer system, a learning process or "learning portfolio" will be recorded and sent to a database. The information contained in this portfolio not only showcases the students' learning style to classroom teachers, but also provides a fair and effective assessment system for students. For students, the system can help them to process their self-regulated learning. Students can also check the portfolio to understand their own learning style and adjust their study methods and strategies accordingly.

## II. RELATED STUDIES

### A. Chinese language Learning Strategies

O'Malley [9] and Oxford [10] pointed out that learning strategies can effectively help students engage in a language. Properly used learning strategies should improve the students' ability and increase their self-confidence. Simply put, learning strategies are used to help learners process information, and the activities increase the learning effectiveness; it is "learning how to learn" as well as a "cognitive strategy". The learners use these skills to gain knowledge [11][12][13].

Smith and Ragan [14] collected several theories on learning strategies and divided them into two types:

1. Cognitive domain strategies: Based on the information process theory, they include organizing strategies, elaborating strategies, rehearsing strategies and metacognitive strategies.
2. Affective domain strategies: These specifically refer to how individuals maintain their mental attitude in order to boost learning strategies.

One possible learning process could be a general review of various perspectives of learning strategies that have the following characteristics [15]: specific methods or skills, procedures and steps, the rules of implicit learning systems. That is, learners can apply effective learning procedures, rules, methods and techniques, to control their learning activities.

Many studies have found that although learning strategies and language ability do not have any decisive positive correlation, a student's language ability and academic achievement can often relate to the diversity and appropriateness of learning strategies. Chamot and Kupper [16] pointed out that during all language acquisition processes, learning strategies should definitely be used. Vann and Abraham [17] and Mullins [18] indicated that proper and timely applied learning strategies are significantly correlated to a better performance in language acquisition.

Teaching Chinese as a second/foreign language is teaching Chinese to non-native speaking foreigners, and therefore it should differ from the first/native language instruction. Xu and Wu [19] pointed out 4 key principles for teaching Chinese as a second language: 1. real content and context, 2. practicing oral speaking, 3. integrating culture and functionality, and 4. following the principles of learner-centered strategies. Creating the proper learning environment is critical. According to instructional design, planning related scenes and creating simulations during the learning process, students will "immerge" into situations that will give their acquisition of a foreign language a huge, necessary advantage.

From the characteristic view of both teaching and learning strategies, a student's learning strategy emphasizes "communication skills", and self-directed learning. It is agreed that using language learning strategies and learning strategies in problem-based learning, and learning by doing, will improve the student's memory and increase motivation. If learners can accurately master the learning strategies and also learn the language for a real purpose, it will allow them to transfer that knowledge and use it in their everyday interactions.

### B. Situated Learning

Situated learning is a theory proposed by constructivists and emphasizes that students need to blend into a constructed context, during the learning process. Schon [20] proposed two learning concepts: "knowing in action" and "reflection-in-action", meaning that much of the specialized knowledge, skills, company regulations, or terms cannot be fully described in words or language, but can only be entered into the professional context by the learner as an apprentice, personal observer or participant, in order to learn professional skills.


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Scribner [21], Suchman [22], Lave [23] and others found, by observing people engaged in work and daily activities, that although people have not received special training, they can solve problems in little time. This reflects the basic idea that cognitive activities in daily life are often due to the prevailing social context. This different problem-solving approach reflects the acquisition of knowledge advocated by Dewey "life is education" and "learning by doing".

Situated learning, known as situated cognition, refers to people, events and objects placed in a learning environment. Learners in a "realistic" environment actively participate and interact with real situations to gain knowledge. Learning should be carried out in real situations, as knowledge is the product of interactions between learners and the context. In fact, learning should influence social context and cultural events. If learning is separated from context, a learner's knowledge is only for a single event and cannot be transferred into deeper thinking. [24]

For elements of situated learning, Collins, Brown and Newman [25] proposed a four part revised model: 1. Content: subject knowledge, thinking strategies, control strategies and learning strategies; 2. Methods: modeling, coaching, scaffolding, clarification, reflective and explorative; 3. Order: increasing complexity, with variability gradually increased from some of the skills to comprehensive skills; 4. Social context: contextual learning, expert training environment, intrinsic motivation, cooperation and competition.

McLellan [26] also indicated that situated learning strategies should include eight factors: story, reflection, cognitive apprenticeship, cooperative learning, instruction, coaching, clarified study skills and technology. Upon careful examination, these factors were categorized into two major parts. The first 7 factors should be categorized as instructional design, the soft part, and technology should be categorized as application media, the hard part. The advantage with technology is that it can enhance the width, depth and variety of learning resources, provide a "first-hand" experience, and increase learning motivation. As McLellan's study mentioned, using wireless handheld devices, such as the media and RFID technology, to create a learning environment integrated into situated learning strategies can help teachers and students overcome the language barrier, and enhance learning performance and motivation.

### *C. Context Awareness and RFID*

The situated learning theory emphasizes how students should blend into the learning environment by exploring and experiencing activities to gain applicable knowledge [27][28]. Also context aware technology combines the surrounding environment with learning content to process language learning. Students' interactions, through their mobile devices, can be an incentive to motivate them and improve their learning performances.

Context means that the location, environment, people and surroundings or situations change [29]. It also includes time changes, interpersonal relationships and social status [30] (Fig. 1). Schilit and Theimer first proposed the concept [31] of environmental context awareness: special actions, such as those by assistive devices or sensors, provide the appropriate information and feedback for users' needs. Dey and Abowd [32] also pointed out that context-aware technology is based on the environment and situations to provide information or services directly related to users. Use of context-aware technology can integrate students with the environment; therefore, they can interact with real-life situations.

As mentioned above, context-aware technology is highly acceptable in education; RFID technology is also being slowly accepted in educational technology. The literature review showed that RFID technology-related studies are still mainly in the industrial field, while educational technology is still at the developmental stage. The literature review also showed that, in educational searches integrating RFID technology, Taiwanese students were strong in every aspect.

Liu, Tan and Chu [33], used an RFID-supported immersive ubiquitous learning environment to assist fifth grade outdoor natural science courses. Tseng, Hsu and Hwang's [34], study was a ubiquitous platform for collaborative learning, where the application of RFID technology helped to introduce university students to the computer. Huang, Hsu and Cheng [35] used RFID to integrate library courses into real-world situations, and created a silent game in the library to improve student motivation. Horng, Horng and Sun [36] used mobile devices with RFID in vocational education and training. Topics covered a wide range, but most were for outdoor natural science observations, or interactions in the field. However, language learning and related issues are rare. The use of an RFID built environment by Ogata and Yano [37], to equip learners with honorifics in Japanese, is one of the few relevant examples of such foreign language learning. Ku and Chang [38] used RFID as a tool for elementary Chinese learning, it did lead to a positive results.

Through previous research conclusions and actual field teaching needs, this research aimed to integrate situated learning strategies and RFID technology to match basic Chinese language instruction, as well as to develop a mobile learning system. Hopefully, taking advantage of the system's entertaining, convenient and information technology, can not only motivate and promote learning effectiveness for students but give the system and foreign language teaching some important recommendations.

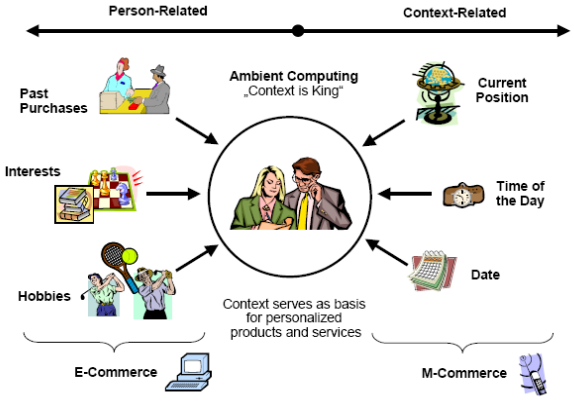


Figure 1. The key factors of context aware [30]


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## III. Experience and System Desing

The main purpose of this study was to design and develop a Chinese language learning system. A design-based research method was employed to conduct this study. Accordingly, to this purpose, the literature review was the most important process to set up the theoretical foundation and structure of the system's design. Before providing instructional strategies, it was critical to clarify the difficulties experienced by exchange students learning Chinese. Therefore, an analysis, design, development, implementation and evaluation process was used to design and develop the Chinese language learning system, while an interview and questionnaire method was used to understand user satisfaction and motivation.

### *A. Learning analysis*

A private university in northern Taiwan has traditionally recruited international students for years. According to the statistics on international affairs, in 2010 only 192 international students and 40 exchange students enrolled. To help foreign students adapt to the Taiwanese school life and culture, the university provides Chinese language courses for foreign students. According to the instructors, the students' language proficiency is quite disparate as they all come from different countries, so it is very difficult for teachers to communicate with all of the students at the same level. In order to help understand and assign students to different groups, instructors have to interview them one on one. If a system can help operate replacement tests, record learning styles and increase student motivation, it should make the learning process easier and reduce the instructor's load. The Chinese language learning support system was designed for this very purpose.

### *B. System design*

This stage was based on the literature review results to plan the curriculum, develop instructional strategies and design a Chinese language learning system. According to the literature, characteristics of interactive teaching are student-centered activities designed for communication in sociable, real life situations. By having task-based activities provided to them students are encouraged to communicate through a variety of activities, complete tasks and improve their ability to communicate. Task-based refers to a topic that must be answered by action. Fig. 2 presents the structure of the context awareness learning system.

- Solid line represents the actual operation as seen by the students' behavior
- Dotted lines represent the non-context that can be directly seen by these actions
- A: The action of students with the client through interactive learning
- B: Mobile device provides feedback to learners
- C: RFID technology provides information to learners through the process of an interactive platform that directs and records metadata in a database.
- D: Database forwards learning strategies and modes to the user interface
- E: Teachers' interface
- F: Teachers are able to retrieve the students' learning styles from the database.
- G: Teachers can help students based on their learning portfolios.

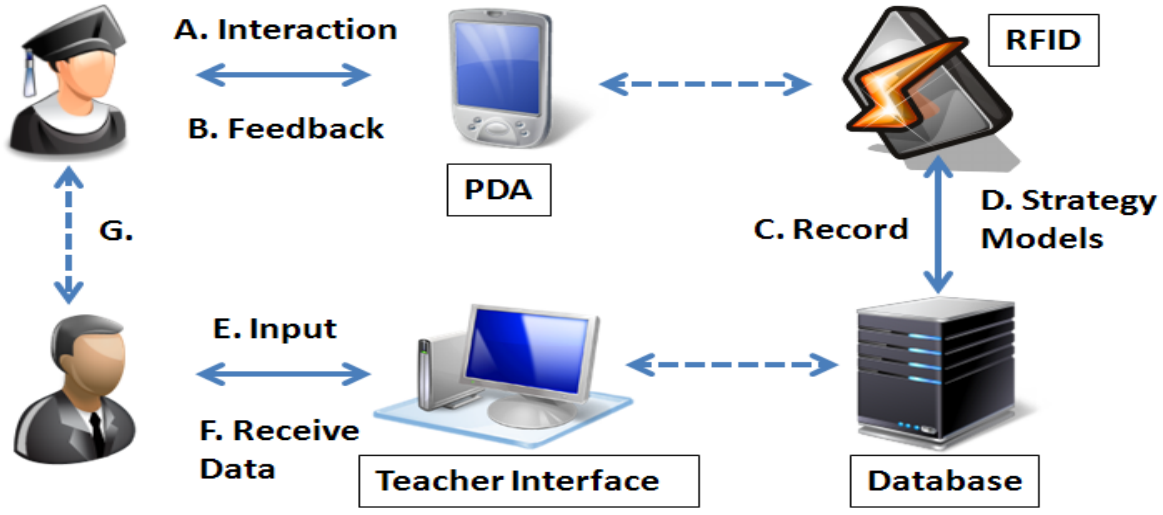


Figure. 2. The system process of the context awareness learning system

### *C. Interface design*

Student Platform

1. Login screen
   Learners can login here. It can identify a student's role and start to record his/her learning profile.


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2. Learning screen
   After a student logs into the system, either the "practice" or "test" mode can be selected. In fact, when a student sees the "test" button, it means there is a requisite test that has to be done right then (Figs. 3 and 4).
3. Learning profile recording
   Students understand their scores and assess their learning situation via the learning profile. Teachers can also keep an eye on students and provide the proper guidance and help to different individuals (Fig. 5).

Teacher Interface

1. Administrator Login
   The teacher or administrator can login from the teachers' interface to create a new test or manage the learning system.
2. Test creator
   In the test creator, the teacher can create a new test or set up a number of questions, dates, scores and the time limitation for a test. Teachers can also edit the type of questions. Both "Listening" and "Reading" type questions include "multiple choice", "sorting" and "positioning" questions.
3. Student learning profile
   The teacher can check test scores either by date or name. The students' learning profiles show their scores, learning difficulties, the time spent on each question and the number of help buttons used. After viewing


Figure 3. Practice/test interface on PDA for users.

these details, the teacher understands each student's learning style and is able to provide the most appropriate assistance.

4. RFID management
   The RFID management function helps instructors to identify the serial number for each tag. Therefore, each question will match the tag and return the correct information to the database.

### D. Participants

For this study, 30 students (15 males and 15 females), were selected through purposive sampling. The subjects were international students who attended the "Life Chinese dialogue" course. About 40 students enroll in this course each semester.

## IV. Research Findings

After pilot testing the Chinese learning support system, 10 students filled out a satisfaction questionnaire, and the descriptive statistics and independent sample t test analysis were reported. The questionnaire had a total of 17 questions and was scored using a four point Likert Scale, with "strongly agree" scoring 4 points; "agree" 3 points; "disagree" 2 points; and "strongly disagree" scoring l point. There are three aspects to the questionnaire: instructional content design, instructional activities design and system design: the higher the total point score, the higher the satisfaction with the system.

### A. Satisfaction of Instructional Content Design

On the four point Likert scale questionnaire, the average scale in the Instructional Content Design was 3.15 points (Table 1). In item 1, "The learning contents relate to real life", all the scores were in the "strongly agree" and "agree"


Figure 4. Test mode: the question shown on PDA for users.


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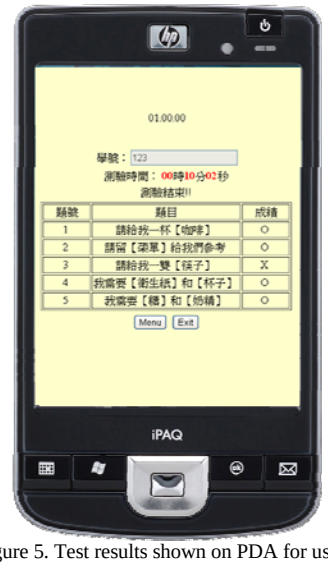


Figure 5. Test results shown on PDA for users.

category and 80% of students felt that the learning content was closely related to their everyday lives. The average score was 3.8. For item 4, "The learning content and learning tasks are fairly equal", students also gave a high score of 3.6. Except for items 2 (2.50) and 3 (2.70), where 70% of users did not feel the question content was appropriate, because they had already been learning Chinese for more than a year, and the questions were too easy for them. In item 3, "The learning content is very challenging for me", 40% of users did not agree. Since the active RFID tags are quite broad, the test items were insufficient to satisfy them.

### *B. Satisfaction of Instructional Activities Design*

According to Table 2, the average score for Satisfaction with the Instructional activities Design was 3.6. In this dimension, most scores were in the "strongly agree" and "agree" category. For example, in item 5 "The learning activities can enhance my learning achievement", the average score was 3.6; all scores placed in the "strongly agree" and "agree" category. 80% of the users also checked "strongly agree" or "agree" for item 6 "Repetitive shadowing of vocabularies and sentences will improve my learning the Chinese language"..

### *C. Satisfaction of System Design*

The average score for Satisfaction with the System Design was 3.53 (Table 3). 20% of users did not agree with item 9 "The font size is appropriate for the handhold device's interface". However, in item 10, "The user interface is very clear and easy to use", 60% of users checked "strongly agree" and 40% checked "agree". It shows that the user interface is well designed and fulfills the users' needs. Yet, some of the complaints related to "The system is very stable and consistent": 20% of users checked "disagree" or "strongly disagree". Since the system uses a 5 second

TABLE I.
SATISFACTION OF INSTRUCTIONAL CONTENT DESIGN

| | Question Item | VA | AG | DA | VD | M |
|---|---|---|---|---|---|---|
| 1 | The learning contents relate to the real life. | 24<br>80% | 6<br>20% | 0<br>0% | 0<br>0% | **3.8** |
| 2 | The level of learning content is just good to me. | 6<br>20% | 3<br>10% | 21<br>70<br>% | 0<br>0% | **2.5** |
| 3 | The learning content is very rich for me. | 3<br>10% | 15<br>50% | 12<br>40<br>% | 0<br>0% | **2.7** |
| 4 | The learning content and learning tasks are very smooth | 18<br>60% | 12<br>40% | 0<br>0% | 0<br>0% | **3.6** |
| **Average Score** | | | | | | **3.15** |

interval to scan the signal, some users really had trouble with the waiting time, but this can be easily resolved.

Although there were some "disagree" reactions to various questions, in item 15, "I would like to use this system to learn different subjects" and item 17, "I am willing to recommend the use of this system to others" averaged 3.8 and 3.7, respectively. Overall, users still supported this system. They would like to use this system again and were also willing to recommend this system to others.

### *D. The Relationship between the Achievement Scores and Total Time Spent*

The system recorded the "Total Time Spent" after users completed the tasks. The longest time was 578 seconds, and the shortest 195 seconds. The Pearson's r result showed that the time spent to complete a task (M=328), and the Pearson correlation was -.763, p=.000, which is an inverse correlation, meaning that the shorter the time, the higher the user's achievement score, and vice versa (see Table 4).

### *E. The Relationship between the achievement scores and satisfaction with the system*

This study assumed that if the achievement scores were high, then the user's satisfaction score would be high. Therefore, the Pearson correlation was used to analyze the relationship between the achievement scores and satisfaction with the system. The results showed that the Pearson correlation was .434, p=. 017 < .05. This number indicates that the achievement scores and satisfaction with using the system were positively correlated, which means that high satisfaction with the system results in higher achievement scores (see Table 5).

## V. CONCLUSTION AND DISCUSSION

In recent years, while research on the application of RFID technology in learning has been thriving, and its related


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technique is quite mature, foreign language instruction and its related research still require further work. This system employs the information on students' learning styles and motivation to guide teachers in the right direction to help students. It also provides self-learning for students so that they may clearly assess its benefits and disadvantages.

TABLE II.
SATISFACTION OF INSTRUCTIONAL ACTIVITIES DESIGN

| Question Item | | VA | AG | DA | VD | M |
|---|---|---|---|---|---|---|
| 5 | The learning activities can enhance my learning achievement | 18 60% | 12 40% | 0 0% | 0 0% | 3.6 |
| 6 | Shadowing vocabularies and sentences repeatly will improve my Chinese learnin. | 24 80% | 6 20% | 0 0% | 0 0% | 3.8 |
| 7 | During the learning activity, system can provide proper guidance when I needed. | 12 40% | 18 60% | 0 0% | 0 0% | 3.4 |
| 8 | I can follow the system guidance to complete the tasks. | 18 60% | 12 40% | 0 0% | 0 0% | 3.6 |
| Average Score | | | | | | 3.6 |

Hopefully, this basic Chinese language learning system will be able to help foreign students learn the language by relying on the system's interaction to augment their language learning. It gives teachers practical opportunities to use the system and receive additional information. It helps them assess learners from different viewpoints and gives them an in-depth understanding of their students' different learning styles.

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TABLE III.
SATISFACTION OF SYSTEM DESIGN

| | Question Item | VA | AG | DA | VD | M |
|---|---|---|---|---|---|---|
| 9 | The font size is appropriate on the interface of handhold device | 12 40% | 12 40% | 6 20% | 0 0% | 3.3 |
| 10 | The user interface is very clear and easy to use | 18 60% | 12 40% | 0 0% | 0 0% | 3.6 |
| 11 | The system "Help"can really support my learning. | 18 60% | 12 40% | 0 0% | 0 0% | 3.6 |
| 12 | The system feedback can assist my learning. | 18 60% | 12 40% | 0 0% | 0 0% | 3.6 |
| 13 | The quality of stabilize of the system is accepted in my standard. | 12 40% | 12 40% | 3 10% | 3 10% | 3.1 |
| 14 | The learning activities can enhance my learning motivation. | 18 60% | 12 40% | 0 0% | 0 0% | 3.6 |
| 15 | I would like to use this system to learning different subjects. | 18 80% | 12 20% | 0 0% | 0 0% | 3.8 |
| 16 | Overall, I feel very comfortable about this learning system. | 18 60% | 9 30% | 3 10% | 0 0% | 3.5 |
| 17 | I am willing to recommend others to use this system | 21 70% | 9 30% | 0 0% | 0 0% | 3.7 |
| Average Score | | | | | | 3.53 |

TABLE IV.
PEASON CORRELATION BETWEEN ACHIEVEMENT SCORES AND COMPLETED TIME SPEND

| | | Scores | Second |
|---|---|---|---|
| Scores | Pearson Correlation | 1 | -.763** |
| | Sig. (2-tailed) | | .000 |
| | N | 30 | 30 |
| Second | Pearson Correlation | -.763** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 30 | 10 |

TABLE V.
PEARSON CORRLATION BETWEEN ACHIEVEMENT SCORES AND SATISFACTION OF SYSTEM USING

| | | Scores | AVG. |
|---|---|---|---|
| Scores | Pearson Correlation | 1 | .434* |
| | Sig. (2-tailed) | | .017 |
| | N | 30 | 30 |
| AVG. | Pearson Correlation | .434* | 1 |
| | Sig. (2-tailed) | .017 | |
| | N | 30 | 30 |


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