

教學行動研究成果報告

題目: Development of a knowledge indicators service system

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Outline

- Background and motivation
- Theoretical foundations underpinning KIS
- System Design
- Experiment design
- Results
- Discussion and Conclusion

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Background and motivation

- The Internet has motivated many research efforts on integrating web-based learning activities into the curriculum (Tsai, Liu, Lin, & Yuan, 2001; Fu, Wu & Ho, 2009).
- Prior research has demonstrated learning benefits, such as
 - (1) **increasing student involvement** with the subject matter
 - (2) **enhancing students' critical thinking skills**
 - (3) **promoting problem-solving skills** among students
 - (4) **providing learners more opportunities to participate in learning activities** without the limitation of knowledge levels (Hill, 1999; Tsai & Tsai, 2003; Cobos & Pifarre, 2008).

Background and motivation

- This study is an examination of a novel method of **merging knowledge sharing and multi-modes of assessment** in such a collaborative context.
- The proposed system, called the **Knowledge Indicators Service (KIS) System**, was used as a platform for **carrying out a knowledge sharing assignment** where students were required to contribute knowledge items for public use.

Background and motivation

- Measuring and understanding the learner's knowledge acquisition ability is important because
- (1) it helps **curriculum developers and designers** provide **adaptive instructions** to enhance the **quality** of the learning process
- (2) teachers in understanding the **knowledge acquisition sources** and **learning status of individual students**
- (3) **fostering critical thinking** and **reflection** among students.

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On-line assessment

- Modern on-line assessment systems offer considerable scope for innovation in a significant improvement of the process for teachers and students (McDonald, 2002).
- Barak and Rafaeli (2004) integrated on-line question-posing and peer-assessment as means for web-based knowledge sharing in learning.

Social construction of knowledge

- Several studies of novel teaching approaches stress the importance of **the learners' knowledge creation and sharing** (Barak & Rafaeli, 2004; Cobos & Pifarre, 2008).
- In this study, learners were asked to develop knowledge items in KIS relating to the course learning contents.

Social modeling theory

- Social modeling theory emphasizes that **social interaction provides opportunities** for **observing** and **imitating** successful behaviors from models, which essentially results in changes in learners' levels of competence in a task (Bandura, 1986).
- The KIS allows students to **view** and **search** knowledge items their peers have constructed and the suggestions their peers have given online.

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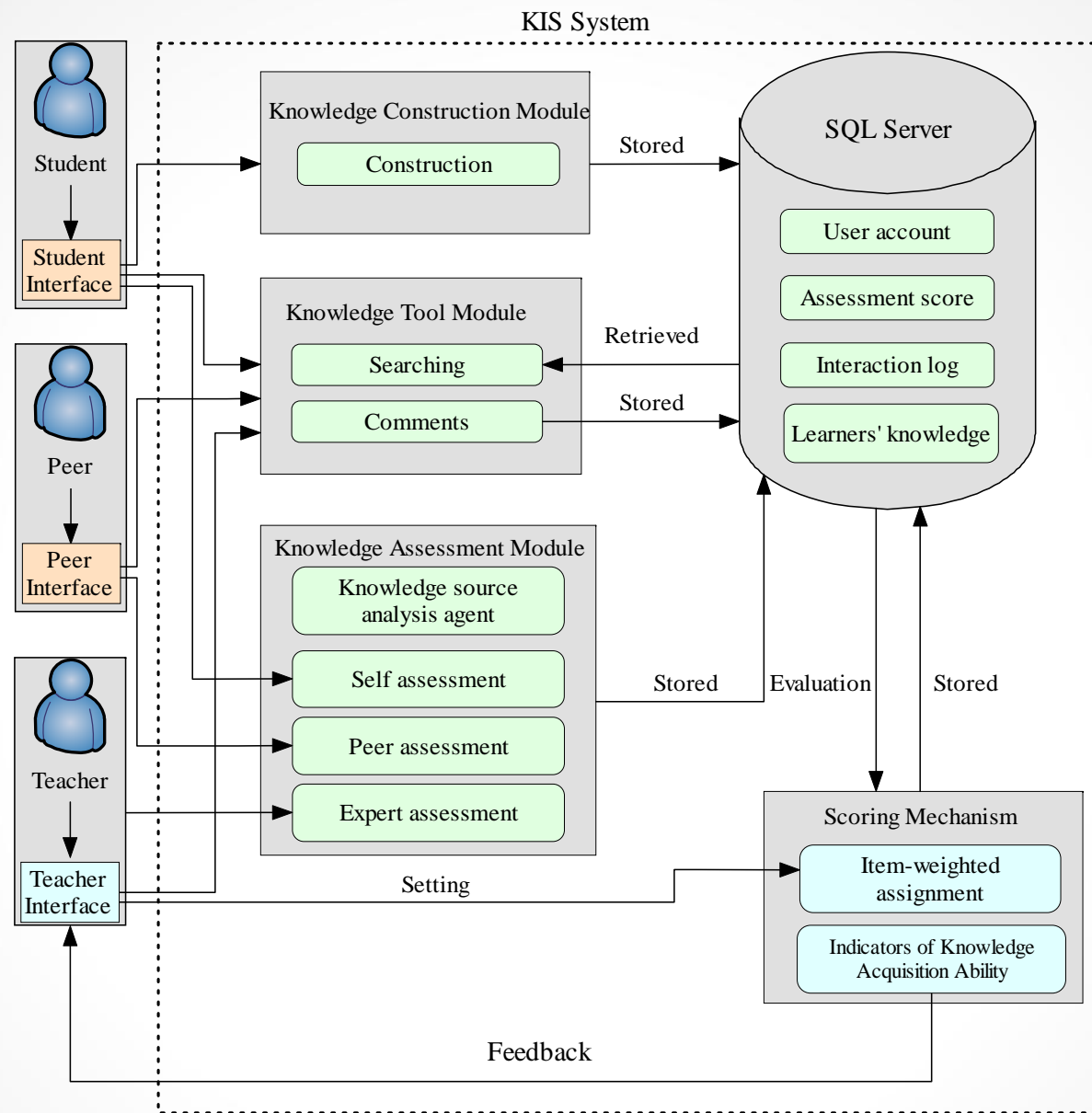

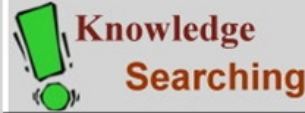
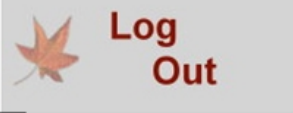


Figure 1. The design of the KIS system.

Knowledge construction module

Knowledge Indicator Service System

 Knowledge Construction  Knowledge Searching  Log Out

ID : (25) Student's ID and knowledge

Construct knowledge

Title :

Keywords :

Source : Knowledge source

Contents : Construct contents

```
<html><head></head><title>Sample</title>
<body>
Your IP address is:
<?php
echo $_SERVER['REMOTE_ADDR'];
?>
</body></html>
```

Attaching file:

Self Assessment :

The knowledge enables me to learn easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
The knowledge increases my understanding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
The knowledge enables me to accomplish learning more quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
The knowledge enhances my effectiveness in my learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
The knowledge improves my learning performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

Self assessment

Figure 2. Screenshot of the knowledge construction function.

The weight of knowledge sources							
Instructor	Self-creation	Peer	Textbook	Internet			
0.5	0.7	0.3	0.5	0.6			
The weight of assessors			The weight of the <i>T</i> value				
Expert assessment	Self assessment	Peer assessment	Average score of all learners <i>T</i> value	The standard deviation of the <i>T</i> value			
1.0	0.5	0.7	60	10			
<input type="button" value="Assignment"/>							
The summary of the indicators of knowledge acquisition ability							
ID.	Knowledge acquisition ability	z value	<i>T</i> value	Assessment counts	Comment counts	Viewing knowledge counts	Details
49526116	27	0.01	60	24	3	63	<input type="button" value="View"/>
49541123	22.5	-0.2	56	32	7	42	<input type="button" value="View"/>
49541141	24.88	-0.09	58	21	5	31	<input type="button" value="View"/>
49741102	21.38	-0.26	55	18	6	27	<input type="button" value="View"/>
49741105	32.25	0.26	65	35	12	74	<input type="button" value="View"/>
49741107	36.88	0.48	70	26	7	66	<input type="button" value="View"/>
49741108	30.38	0.17	63	33	6	53	<input type="button" value="View"/>
49741112	36.88	0.48	70	24	4	64	<input type="button" value="View"/>
49741113	28.62	0.09	62	38	6	53	<input type="button" value="View"/>
49741114	17.88	-0.42	52	20	3	15	<input type="button" value="View"/>

Figure 4. Screenshot of a summary of the indicators of knowledge acquisition ability and the relevant weights assignment.

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Research problems

- To evaluate the effectiveness of the KIS system, this research designed a case study conducted in an authentic university course.
- The course was the **Web Programming and Design**.
- (1) Is there **significant improvement** in students' **learning achievements** with the system?
- (2) Are there **significant differences** among **self assessment, peer assessment and expert assessment** in terms of knowledge acquisition ability of individual students?
- (3) How does using the KIS system affect learner's learning activities?
- (4) What are the students' **attitudes** toward using the KIS system, and what is the perceived system **satisfaction**?

Experiment procedure and participants

- The experiment was conducted for a period of six weeks.
- The participants of this experiment were **two classes of second-year undergraduate students** attending the course Web Programming and Design.
- One class (**52 students**) was assigned to be the **experimental (KIS) group** and the other (**50 students**) was the **control group**.

Experiment procedure and participants

- All participants had the same course content and instructor.
- The students in **the control group learned with the conventional learning approach**; that is, all the study sessions were conducted in a classroom equipped with a teaching broadcast system, personal computers and the LCD projector.

Research instruments

- A **pre-test** and a **post-test** were developed to evaluate the learning effectiveness of the students.
- **Both the pre-test and the post-test were designed by the instructor.**
- The tests were also evaluated by two computer science educators for expert validity.
- Some unsuitable questions was modified, removed, alternated, and arranged.

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Comparison of the learning achievements between the control and experimental groups

- Before the experiment, the two groups took a pre-test to ensure that they had equal abilities in this subject before the learning activity.
- The mean and standard deviation of the pre-test were 49.75 and 10.92 for the experimental group, and 47.82 and 10.75 for the control group.
- The t-test result showed that these two groups did not differ significantly ($t = 0.89$, $p > .05$); that is, the two groups of students had statistically equivalent abilities before learning the subject.

Comparison of the learning achievements between the control and experimental groups

- To acquire more objective the score, the study compared students' learning achievements with the average of the assessment scores by the two experts.

Table 1. Descriptive data and ANCOVA of the post-test results

Variable		N	Mean	SD	Adjusted mean	Std. error.	F value	d
Post-test	Experimental group	52	78.27	11.19	77.71	1.10	5.99*	0.52
	Control group	50	72.56	10.59	73.35	1.12		

* $p < .05$.

Comparison among self, peer and expert assessments

Table 2. The descriptive statistics on analysis of assessment among expert, self and peer

	N	Mean	SD	Std. Error	95% Confidence Interval		Min.	Max.
					Lower Bound	Upper Bound		
Expert	52	2.64	0.85	0.11	2.40	2.87	1.00	4.67
Self	52	3.95	1.06	0.14	3.65	4.24	1.00	5.00
Peer	52	2.93	0.61	0.08	2.76	3.10	1.29	4.33
Total	156	3.17	1.02	0.08	3.01	3.33	1.00	5.00

Table 3. The ANOVA analysis of expert, self and peer assessments

Source	Sum of squares	df	Mean square	F-value	Sig.
Between groups	49.06	2	24.53	33.053	0.000*
Within groups	113.54	153	0.74		
Total	162.60	155			

* $p < .05$.

Table 4. Post hoc multiple comparisons (Tukey HSD method)

(I) assessment	(J) assessment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval		Post Hoc analysis
					Lower Bound	Upper Bound	
Expert	Self	-1.31*	0.16	.000	-1.71	-0.91	Self > Expert
	Peer	-0.29	0.16	.186	-0.69	0.10	
Self	Expert	1.31*	0.16	.000	0.91	1.71	Self > Expert
	Peer	1.01*	0.16	.000	0.61	1.41	Self > Peer
Peer	Expert	0.29	0.16	.186	-0.10	0.69	
	Self	-1.01*	0.16	.000	-1.41	-0.61	Peer < Self

*The mean difference is significant at the 0.05 level.

Effects of using the KIS system on learner's learning activities

- 1. Analysis of learner's knowledge sources

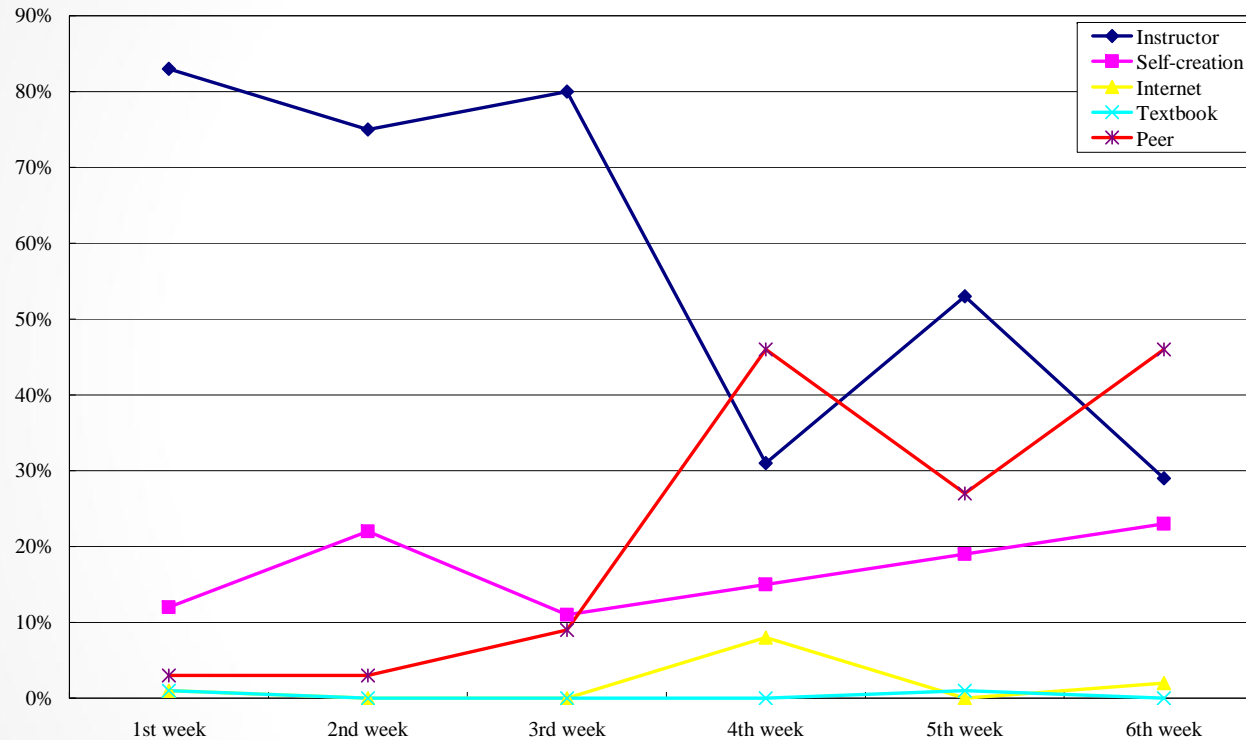


Figure 7. The percentage of knowledge sources in six weeks.

- Such findings suggest the **KIS system positively influenced the collaborative learning activity.**

Effects of using the KIS system on learner's learning activities

- 2. Analysis of viewing knowledge counts and frequency of knowledge creation

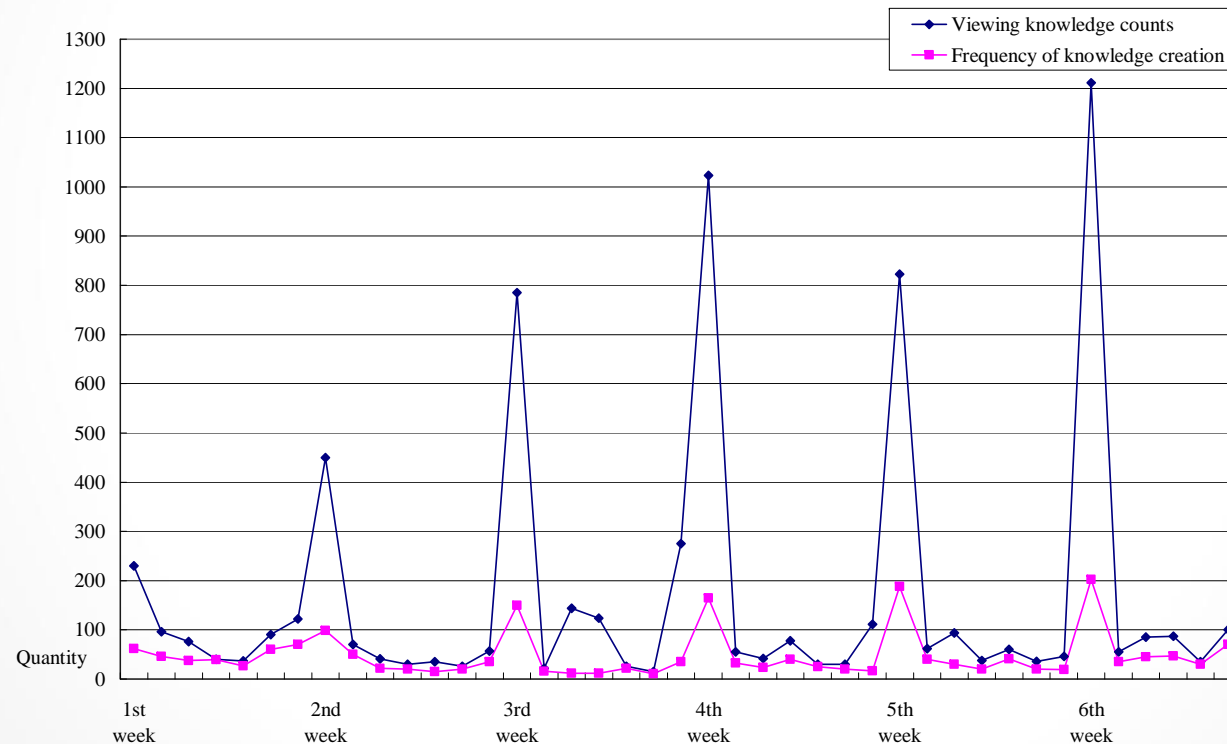


Figure 8. The trend of viewing knowledge counts and frequency of students' knowledge creation.

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Discussion and Conclusion

- Experimental results indicate that the KIS system had **positive affects on achievement** and its knowledge sharing features can **enhance communities of learners**.
- The KIS system also **provides more diverse forms of assessment** than traditional pen-and-paper assessment.

Discussion and Conclusion

- This study also found the KIS system can provide learners with **more opportunities and benefits in collaborative learning activities.**
- According to the result of **knowledge source analysis**, this not only **improves learners' reflection**, but also helps students **obtain more comprehensive knowledge.**
- The finding supports the argument of a previous study that **self and peer assessments could help students learn autonomously and reflectively** (Sung et al., 2003).

Limitations and future research

- The proposed system may be **similar to other knowledge management systems**, but provides an additional approach to evaluating knowledge acquisition ability.
- Whether providing the indicators of knowledge acquisition ability affects **learning motivation** is unclear.
- Therefore, future research is necessary to verify the learning motivation of this study.