A study of the Platform function for primary school science and life technology teachers who practice knowledge management

Kuo-hung Tseng[1], Hua-Lin Tsai[2,] Chi-Jen Lee[2] ,Tien-Sheng Tsai[2],

1 Department of Business Administration
Meiho Institute of Technology

[2]Department of Industrial Technology Education
National Kaohsiung Normal University
*No.188, Zhongyi St., Fengshan City, Kaohsiung County 830
Taiwan, R.O.C.
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Abstract This study aims at understanding the effects of practicing knowledge management using digital platform by the science and life technology teachers in the primary schools, and also analyzing the path model of the knowledge management effects. The platform records analysis and the questionnaire survey method are adopted in this study. The subjects of the platform records analysis are six science and life technology teachers teaching in the primary schools in Kaohsiung County. And the subjects of the questionnaire are the students of the six teachers. It is found that the effects of practicing knowledge management reach the standard of significance, and thus establish the path model which shows how knowledge acquirement, knowledge sharing, and knowledge application connect to knowledge innovation.
Key words: knowledge management, platform function, science and life technology teacher

1   Introduction

In this study, the software and hardware environment of knowledge management (including websites and learning function) will first be established. Then we will select the subjects to attend the application of knowledge management. At the end, the records on the platform will be analyzed. This research aims at understanding the operation function and the path model of the four levels, knowledge acquirement, knowledge sharing, knowledge application, and knowledge innovation (referred as 'the four level' below), during the application of knowledge management by the science and life technology teachers in the primary schools.

2   Purposes of the Study

1. Understanding the operation function of knowledge management on the digital platform.
2. Analyzing the relationship between the effects of practicing knowledge acquirement, knowledge sharing, knowledge application, and knowledge innovation by the subjects.
3. Analyzing the subjects' anticipation towards knowledge innovation by applying knowledge acquirement, knowledge sharing, and knowledge application.

4. Establishing a path model of applying digital knowledge management for the subjects of the virtual community.
5. Making practical suggestions for applying knowledge management for the bureaus of educational administration, the primary schools, and the science and life technology teachers.

3   Application of Digital Platform on Teaching Resources Websites

Here we try to explore the purposes and the definition of teaching resources websites. Teaching resources center is a place that provides resources and service to improve teacher's teaching and student's learning. [1] Therefore, teaching resources websites are defined as the websites where the functions of the Internet provide resources to promote teaching and learning. According to the documents and cases, teaching resources websites include the functions as following[1] [3] [4] [5].

3.1 Introducing and linking internet resources

International information websites are networks based on multimedia. Proper websites with related topics can be classified and reviewed for website users in the teaching resources websites [2] [9],

3.2 Providing channels for user's feedback and discussion

Interactive and non-interactive approaches are proposed to provide channels for feedbacks and discussions on the teaching resources websites. Furthermore, they can be developed as a web-based learning environment[3] [10]. Discussion Board' can be set for teachers and other users sharing their experiences, and also for students searching for help on their leaning.

3.3 Providing networks for related activities

Teachers and education institutions can announce information such as workshops, training courses, seminars, and cooperative projects on international information websites. Users can register, ask questions, or request detailed information online that saves costs and time while information can be distributed further[11].

3.4 Providing related teaching resources

Teaching resources websites can serve as a data base providing electronic documents such as journals, teaching plans, and indexes for teachers, students, and experts. There are some websites that provide the service, i.e., Ask ERIC (http://ericir.syr.edu) providing educational literature, online multimedia encyclopedia on Encarta Online (http://www.iac-on-encarta.com), Webquest (http://edweb.sdsu.edu/webquest/webquest.html) that aims at fostering student's problem solving ability, and Discovery School (http://discoverschool.com/lessonplans/index.html) that provides teaching plans and information based their TV program.

3.5 Providing news and information

International information websites are suitable for updating news and events frequently. It is also proposed that experts are invited to write teaching plans based on international and domestic news to be published online regularly for teachers[6] [8] [12].

3.6 Providing teaching guide and assisting tool

Teaching resources websites can provide guides to design teaching plans, check lists, and other assisting tools by using multimedia and text on the websites[5] [7].

3.7 Presenting the productions and teaching results

Teaching resources websites can present teachers' and students' productions and invite experts and users to make comments or suggestions.

4 Methodology

This study will adopt platform records analysis and survey research method. First the software and hardware environment for knowledge acquirement will be established, and then subjects will be selected. Then questionnaires for the students of the subjects will be designed to understand the operation function and effects in knowledge management.

4.1 Research field

The freeware of 'Share Point Team Service' is applied on the platform in this study after consulting experts and primary school teachers from different countries about its suitability.

4.2 Background of the cases

The six cases selected in this study are the science and life technology teachers in primary schools.

4.3 tools

This questionnaire is designed according to the operation function of the platform, and then reviewed by scholars and experts before being revised by several primary school teachers. The 66 subjects of this questionnaire are the students of the subjects in this study. The pretest was made in May, 2004, and the retrieve rate was 100% among the 66 questionnaires.

After retrieving the questionnaire, the items of which the discriminations were above the threshold were selected after item analysis. The Cronbach α coefficient is .6858 which shows a good reliability.

5 Data Analysis and Discussion

5.1 The Effects of Using the Platform

It is found that the interaction between the platform and the subjects were intensive that the professional knowledge of the subjects developed continuously. Due to the support of the document base and the discussion board, the sharing on the website was still growing as the workload of the subjects increased. There were 482 records of knowledge acquirement on the platform in the first month, 526 records in the second month, and 742 records in the third month. (see table 1)

Table1 the growth of the interaction on knowledge management on the platform

	Records on the platform
The first month	482
The second month	526
The third month	742
Total	1750

5.1.1 t-test analysis of effects of students' attitude towards teachers' practicing knowledge management

From table 2, the mean of t-test is 3.9969, t=44.583, which reaches the standard of significance. (p<.001) It shows that the students have positive attitude towards the subjects' practicing knowledge management because the result is higher than the test value, 3.

Table2: t-test analysis of the effects on the students when the subjects practice knowledge management

	Mean	SD	t
Summary	3.9969	.4533	44.583***

Test value=3   n=411   ***p<.001

5.1.2 t-test analysis of effects of students' attitude towards teachers' practicing knowledge acquirement

From table 3, the mean of t-test in G1 is 4.35, and t=32.423. In G2, the mean is 4.02, and t=29.751. In G3, the mean is 3.91, and t=23.936. In G4, the mean is 3.75, and t=24.254. In G5, the mean is 3.92, and t=24.047. In G6, the mean is 4.01, and t=22.135. In G7, the mean is 4.00, and t=21.145. In G8, the mean is 3.89, and t=21.145. The results reach the standard of significance. (p<.001) It shows that the students have positive attitude towards the subjects' practicing knowledge acquirement.

Table3: t-test analysis of the effects on the students when the subjects practice knowledge acquirement

Item	Questions	Mean	SD	t
G1	The teacher would instruct me skills of searching related information on the internet.	4.35	.84	32.423***
G2	The teacher would instruct me how to find related information of the subject properly.	4.02	.70	29.751***
G3	The teacher would instruct me in looking for the extracurricular information.	3.91	.77	23.936***
G4	The teacher would instruct me in downloading the related information of the subject.	3.75	.79	24.254***
G5	The teacher would instruct me in downloading the extracurricular information.	3.92	.77	24.047***
G6	The teacher would introduce some domestic websites which have related information of the subject.	4.01	.92	22.135***
G7	The teacher would introduce some domestic websites which have extracurricular information.	4.00	.81	25.198***
G8	The teacher has introduced related foreign information in the class.	3.89	.85	21.145***

Test value=3   n=411   ***p<.001

5.1.3 t-test analysis of effects of students' attitude towards teachers' practicing knowledge sharing

From table 4, the mean of t-test in S1 is 4.11, and t=29.307. In S2, the mean is 4.03, and t=25.840. In S3, the mean is 3.95, and t=22.551. In S4, the mean is 3.93, and t=22.322. In S5, the mean is 3.84, and t=19.653. In S6, the mean is 3.88, and t=18.738. In S7, the mean is 4.12, and t=27.820. In S8, the mean is 3.99, and t=27.921. In S9, the mean is 3.92, and t=21.769. In S10, the mean is 3.94, and t=19.630.The results reach the standard of significance. (p<.001) It shows that the students have positive attitude towards the subjects' practicing knowledge sharing.

Table4: t-test analysis of the effects on the students when the subjects practice knowledge sharing

Item	Questions	Mean	SD	t
S1	The teacher often shares some related information of the subject he/she found in the class	4.11	.77	29.307***
S2	The teacher often shares supplementary documents of the subject in the class	4.03	.81	25.840***
S3	The teacher often shares what he/she has learned from reading the related information of the subject.	3.95	.85	22.551***
S4	The teacher often shares what he/she has learned from reading the supplementary documents of the subject.	3.93	.85	22.322***
S5	The teacher would discuss with me about the related information of the subject he/she has found	3.84	.87	19.653***
S6	The teacher would discuss with me about the	3.88	.96	18.738***
	supplementary documents of the subject he/she has found.			
S7	The teacher would instruct me in sharing the supplementary documents I found with others during group discussion.	4.12	.82	27.820***
S8	The teacher would instruct me in sharing what I have learned from the supplementary documents with others during group discussion.	3.99	.72	27.921***
S9	The teacher often provides me the information he/she shared with other teachers.	3.92	.85	21.769***
S10	The teacher often shares what he/she learned from sharing with other teachers.	3.94	.97	19.630***

Test value=3   n=411   ***p<.001

5.1.4 t-test analysis of effects of students' attitude towards teachers' practicing knowledge application

From table 5, the mean of t-test in A1 is 3.95, and t=22.659. In A2, the mean is 3.96, and t=23.033. In A3, the mean is 3.77, and t=16.167. In A4, the mean is 3.96, and t=20.264. In A5, the mean is 4.16, and t=28.401. In A6, the mean is 4.05, and t=24.958. In A7, the mean is 4.00, and t=25.544. In A8, the mean is 3.94, and t=2.294. In A9, the mean is 3.94, and t=22.297. In A10, the mean is 4.01, and t=25.042.The results reach the standard of significance. (p<.001) It shows that the students have positive attitude towards the subjects' practicing knowledge application.

Table 5: t-test analysis of the effects on the students when the subjects practice knowledge application

Item	Question	Mean	S	t

m			D	
A1	The teacher would instruct me in dong assignment with the supplementary information obtained on the internet.	3.95	.85	22.659***
A2	The teacher would instruct me in writing a leaning list with the related information obtained on the internet.	3.96	.85	23.033***
A3	The teacher would instruct me in writing my diary with the information obtained on the internet.	3.77	.97	16.167***
A4	The teacher would instruct me in making leaning files with the supplementary information obtained on the internet.	3.96	.96	20.264***
A5	The teacher would use the information downloaded from the websites as the supplement of the subject.	4.16	.83	28.401***
A6	The teacher would design different learning activities with the information downloaded from the internet.	4.05	.85	24.958***
A7	The teacher would use the information obtained from the internet in the class.	4.00	.79	25.544***
A8	The teacher would instruct me in completing a research through group discussion with the supplementary information provided by the teacher.	3.94	.86	22.294***
A9	The teacher would instruct me in completing a research through group discussion with the supplementary information provided by the classmates.	3.94	.84	22.597***
A10	I am happy applying the downloaded information in my learning.	4.01	.82	25.042***

Test value=3   n=411   ***p<.001

5.1.5 t-test analysis of effects of students' attitude towards teachers' practicing knowledge innovation

From table 6, the mean of t-test in C1 is 4.25, and t=28.825. In C2, the mean is 4.17, and t=28.404. In C3, the mean is 3.91, and t=21.522. In C4, the mean is 3.87, and t=17.830. In C5, the mean is 3.73, and t=15.272. In C6, the mean is 4.07, and t=24.084. In C7, the mean is 4.06, and t=25.333. In C8, the mean is 4.21, and t=30.812. The results reach the standard of significance. (p<.001) It shows that the students have positive attitude towards the subjects' practicing knowledge innovation.

Item	Question	Mean	SD	t
C1	The teacher would create new learning activities with the supplement in the class.	4.25	.88	28.825***
C2	The teacher would create interesting learning activities with our discussion results.	4.17	.84	28.404***
C3	The teacher would create my suitable learning activities using the information	3.91	.86	21.522***

	offered by my classmates.			
C4	The teacher would provide a learning list for my parents and I to complete together.	3.87	.99	17.830***
C5	The teacher would provide activities for my parents and I to participate together.	3.73	.98	15.272***
C6	The teacher would give the lectures in different places, not only in the classroom.	4.07	.90	24.084***
C7	The teacher would look for teaching materials in the natural environment.	4.06	.85	25.333***
C8	The teacher would instruct me in completing innovative research using the resources of the natural environment in the community.	4.21	.80	30.812***

Test value=3   n=411   ***p<.001

5.2 The relationship, effects, and path model of the subjects' practicing knowledge management in the virtual community

There are three main hypotheses in this study. First, there is no significant relationship between the subjects' practicing knowledge acquirement, knowledge sharing, knowledge application, and knowledge innovation. Second, there is no significant effect on knowledge innovation when the subjects practiced knowledge acquirement, knowledge sharing, and knowledge application. Third, There is no path model of the subjects' knowledge acquirement, knowledge sharing, knowledge application, and knowledge innovation.

5.2.1 The relationship analysis of the subjects' practicing knowledge acquirement, knowledge sharing, knowledge application, and knowledge innovation.

The results are shown as table 7 below.

Table 7: Summary of the relationship between knowledge acquirement, knowledge sharing, knowledge application, and knowledge innovation

	Knowledge Acquirement	Knowledge Sharing	Knowledge Application	Knowledge Innovation
Knowledge Acquirement	1.000			
Knowledge Sharing	.614***	1.000		
Knowledge Application	.634***	.766***	1.000	
Knowledge Innovation	.502***	.682***	.741***	1.000

***p<.001

According to table 7, the results of the subjects' knowledge acquirement, knowledge sharing, knowledge application, and knowledge innovation all have positive effects and reach the standard of significance. (p<.001) Therefore, the first hypothesis 'there is no significant relationship between the subjects' practicing knowledge acquirement, knowledge sharing, knowledge application, and knowledge innovation' is not supported. It indicates that there is significant relationship between them.

5.2.2 The analysis of the effects on knowledge innovation when the subjects practices knowledge sharing and knowledge application

According to the analysis results in table 8, the variances of 58.1% and 55.0% indicate that there are effects on knowledge innovation when practicing knowledge sharing and knowledge application. Therefore, the second hypothesis is partly supported that there are significant effects on knowledge innovation when practicing knowledge sharing and knowledge application while there is not significance effect on that with knowledge acquirement.

Table 8: the regression analysis of the effects on knowledge innovation when the subjects practices knowledge sharing and knowledge application

	R	R2 cumulannt	R2 increase	β	F
Knowledge Application	7.41	.550	.550	.529	499.041 ***
Knowledge Sharing	7.62	.581	.032	.277	283.163 ***

***p<.001

5.2.3 The path model of the subjects' practicing knowledge acquirement, knowledge sharing and knowledge application, and knowledge innovation.

According to table 9, it is seen that the path coefficient in each part reaches the standard of significance, except the one between knowledge acquirement and knowledge innovation. It shows the results as below. Knowledge acquirement has no significant effect on knowledge innovation (β=-.006). Knowledge sharing has significant effects on knowledge innovation (β=.279). Knowledge application has significant effects on knowledge innovation (β=.532). Knowledge acquirement has significant effects on knowledge application (β=.263). Knowledge sharing has significant effects on knowledge application (β=.605). Knowledge acquirement has significant effects on knowledge sharing (β=.614).

Table 9: the analysis of the path model of the effects on the subjects' practicing knowledge acquirement, knowledge sharing and knowledge application, and knowledge innovation

Self variables	Dependent variables	F	β	T
Knowledge acquirement			-.006	-.138
Knowledge sharing	Knowledge innovation	188.328 ***	.279	5.396***
Knowledge application			.532	10.079***
Knowledge acquirement	Knowledge application	347.499 ***	.263	6.895***
Knowledge sharing			.605	15.847***
Knowledge acquirement	Knowledge sharing	247.664 ***	.614	15.737***

***p<.001

According to the analysis above, the figure can be shown as figure 1:
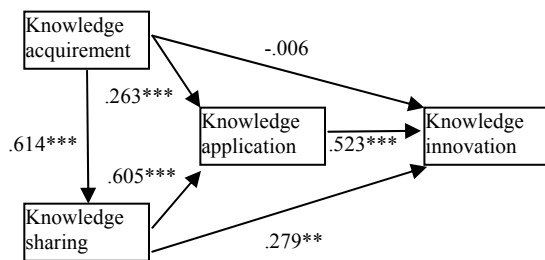
***p<.001

Fig 1, The path of knowledge management

There are six significant paths:
Knowledge sharing → Knowledge innovation
Knowledge application →Knowledge innovation
Knowledge acquirement → Knowledge application → Knowledge innovation
Knowledge sharing → Knowledge application → Knowledge innovation
Knowledge acquirement → Knowledge sharing → Knowledge innovation
Knowledge acquirement →Knowledge sharing → Knowledge application → Knowledge innovation
The six paths analysis has direct influence on knowledge innovation that conforms to the views of some experts and scholars[4] [6] [7] [8]. Therefore, the third hypothesis is not supported that there are six significant paths on knowledge innovation when the subjects practicing knowledge acquirement, knowledge sharing, and knowledge application.

5.2.4. The effects on the subjects' practicing knowledge management
The results are as below.
In table 10, the mean is 4.0061, and t=43.920. In table 11, the mean is 3.9969, and t=44.583. In table 12, the mean is 3.9740, and t=38.905. And in table 13, the mean is 4.0353, and t=36.744. These all reach the standard of significance.
From the questionnaire survey, it shows that the students have significantly positive attitude towards the effects on the subjects' practicing knowledge management.

Table 10: t-test of the effects on the students when the subjects practices knowledge acquirement

	Mean	SD	t
Summary	4.0061	.4644	43.920***

Test value=3 n=411　　***p<.001

Table 11: t-test of the effects on the students when the subjects practices knowledge sharing

	Mean	SD	t
Summary	3.9723	.5563	35.435***

Test value=3 n=411　　***p<.001

Table 12: t-test of the effects on the students when the subjects practices knowledge application

	Mean	SD	t
Summary	3.9740	.5075	38.905***

Test value=3 n=411　　***p<.001

Table 13: t-test of the effects on the students when the subjects practices knowledge innovation

	Mean	SD	t
Summary	4.0353	.5712	36.744***

Test value=3 n=411   ***p<.001

6. Conclusion

This study found that the operation function of practicing knowledge management needs deep and thorough interviews and consultation before selecting the subjects. Furthermore, communicating with members, creating an liberal atmosphere, integrating resources, and mastering the advantages of a professional leader to create a leaning environment on the Internet. Besides, it is seen that the students agree with the significance of the teachers' practicing knowledge management. The six paths show the significant effects on knowledge innovation from practicing knowledge acquirement, knowledge sharing, and knowledge application.

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