How Teachers Use and Manage Blogs: A Cluster Analysis in Taiwan

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Abstract

The development of Web 2.0 ushered in web-based tools including blogs. This study focused on how teachers use and manage blogs. A sample of 165 teachers' blogs in Taiwan was analyzed using factor analysis, cluster analysis, and qualitative content analysis. First, the teachers' blogs were analyzed according to 6 criteria (total number of posts, article category, links, page score, index score, and influence score). The crucial factors that influence teachers' use of blogs were then summarized using factor analysis. Finally, cluster analysis was used to divide the sample into groups of similar blogs. Four groups were identified: ageneral group, abalanced development group, ahigh-impact group, and ahigh-knowledge management/sharing group. In addition, on the basis of the content analysis results for these 4teacher groups, we provide suggestions for teachers and teacher educators regarding the advantages and benefits of using blogs.

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In recent years, blogs have become increasingly popular. In contrast to traditional online forums, blogs can be used as knowledge-filtering tools and personal digital notebooks (Blood, 2002). Blogs not only serve as an environment for a community's knowledge sharing but also enable a person to express his or her personal style (Nardi, Schiano, Gumbrecht & Swartz, 2004). Many studies have investigated the behaviors of using blogs (e.g., Chang & Liu, 2008; Herring, Scheidt, Wright & Bonus, 2005; Hou, Chang & Sung, 2009; Kerawalla, Minocha, Kirkup & Conole, 2009) and the merits of blogs in education (Churchill, 2009; Fessakis, Tatsis & Dimitracopoulou, 2008; Hou, Chang & Sung, 2009, 2010; Huang, Jeng & Huang, 2009; Kerawalla et al., 2009; Liu, Shih & Tsai, 2011; Luehmann, 2008; Makri & Kynigos, 2007; Nicholas & Ng, 2009; Sun, 2010; Wang, Huang, Jeng & Wang, 2008; Yang, 2009).

Because some of the teacher community lacks knowledge sharing, teaching-related knowledge, it is difficult to externalize or control, remains rather tacit(Carrollet al., 2003; Tyack & Cuban, 1995). Because blogs enable managing personal knowledge and community sharing, studies have explored the use of blogs forenhancing critical reflection and community of practice (Hou, Chang & Sung, 2010; Yang, 2009). Blogs can be a practical tool for teachers' professional development (Hou, Chang& Sung, 2009). Gaining a deeper understanding of teachers' blogs and their possible application patterns enables understanding more clearly how teachers use and manage blogs, including how they share knowledge by using this technology. The above analyses serve as essential references for teacher educators in their formulation of courses or training on the use of blogs.

LiteratureReview

Analysis of Teacher Blogs

As Liu, Shih, and Tsai (2011) mentioned, "A hyperlink educational blog provides a practical Internet platform for interactions and discussions with rapid accumulation and sharing of knowledge." Increasingly more teachers share their teaching experience and reflection and teaching material through blogs. Blogs are effective not only for sharing but also for gaining feedback from other teachers to enhance teaching. Because of the high use of blogs, numerous researchers have examined how and why teachers use them. For example, some Taiwanese researchers have investigated how teachers apply blogs in teaching or how

students learn writing through blogs, but only a few studies have focused on how teachers manage blogs. Chang and Liu (2008), and Tsai and Hou(2007)have discussed how teachers identify their role as a teacher and how they manage blogs, whereas a paper written in English focuses on the analysis of a social network of teachers' blogs.

Chang and Liu (2008)applied quantitative research to analyze the conditions under which teachers use blogs. Moreover, factor analysis is used to analyzethe factors affecting teachers'use of blogs. Two factors influence teachers' willingness to use and continue managing blogs: how much their blogs influence the public (refered to here after as "influence") and management. On the basis of these two factors, influence and management, we collected 101 teachers' blogs. By applying cluster analysis, we distinguished four domains: high influential, high management, new-comers, and sustainability of management.

Regarding analysis of the features, functions, and applications of blogs, Herring et al. (2005) analyzed the presence or absence of article archives, badges, images, comment, e-mail contact with hosts, advertisements, search functions, calendars, and message boards. The results showed that more than half of the sampled blogs included an article archive, badges, and images. Researchers have also analyzed the headers and footers of such blogs and revealed that the information most frequently included in the header was the date, and the information most frequently displayed in the footer was the time.

Regarding knowledge-sharing content, the most common analytical method in studies on blogs is content analysis based on the specific goals of researchers. Herring et al. (2005) sought to understand the use of blogs through content analysis. In the context of education, Hou, Chang, and Sung (2009) conducted quantitative content analysis of online discussions by 495 teachers in their blogs. In the same study, the features, patterns, and limitations of the knowledge construction structure of blogs were also analyzed. Concerning students, Kerawalla et al. (2009) proposed an empirically grounded framework for studying the use of blogs. On the basis of interviews of students who blogged for a course, the authors included factors suchas the audience, comments, blogging community, and presentation of blogs; they distinguished five blogging purposes: sharing, personal use, keeping a study log, increasing one's motivation to study, and storage.

To summarize, relevant research has explored the basic features of blogs, the content of knowledge-interactions, and blogging purposes. Regarding the overall knowledge construction structure of blogs, the knowledge-sharing characteristics of bloggers can be analyzed to determine hidden patterns and clusters. Few studies have investigated these

aspects, which could enable understanding blogs from another perspective. Therefore, in this study, we adopted factor analysis and cluster analysis to understand Taiwanese teachers' use of blogs.

Chang and Liu (2008) in 2006 conducted a pilot study, collecting 101 blogs. In a descriptive statistical analysis, blogs were analyzed according to the total number of posts, links, article category, index score, page score, and influence score. Two factors, influence and management, were identified using factor analysis. The influence factor includes the page score, influence score, index score, and total number of posts. The management factor includes links and the article category. Cluster analysis identified four groups of similar blogs: high-management, high-impact, novice, and veteran. The management factor yielded through factor analysis is still inadequate because the study of Chang and Liu (2008) hypothesized that the total number of posts should fall under the management factor. However, they could not determine whether more posts meant more influence. If posts were not referenced or recommended by other people, then the influence score could not be high. These limitations indicate that a more accurate understanding of teachers' blogging behavior clusters can be achieved by exploring detailed factors (such as the factors in Herring et al., 2005). Moreover, because of the limitations of teachers' knowledge sharing, we conducted further analysis by addressing additional factors (including the blog service provided, grade level taught, total number of posts, links, article category, index score, page score, and influence score) and used qualitative content analysis to describe the characteristics of teachers' blogs. This approach enabled exploring the possible behavioral groups of teachers' knowledge sharing, management, and interactive influences. The results of these analyses may serve as valuable references for teachers and system developers who use blogs in teaching or tool development.

The specific purposes of this study were (a) to use factor analysis and cluster analysis to understand the potential grouping and behavioral patterns in the use of blogs by teachers in Taiwan, and (b) to use content analysis to analyze blogs, including their features and content. For each of the four groups of blogs, two research questions were addressed:

1. *Can the characteristics of teacher blogs effectively divide them into unique groups?*
2. *What are the characteristics of individual blogger groups?*

On the basis of the clustering results, we offer suggestions and a discussion for teacher education.

Method

Sample

The subjects of this study were the blogs of teachers in Taiwan from kindergarten through university levels. The aim of the study was to understand recent patterns in teachers' blog use. Before analyzing these patterns, we sought to understand the functions and features provided by the blog service providers (BSPs) that the teachers utilized. Therefore, these functions and features were considered in further analysis.

In this study, the sample selection process was divided into two phases. In the first phase, examples of teachers' blogs were collected; the second phase involved the preliminary screening of the collected blogs.

We first searched an education-related blogging service. By clicking on blog categories and searching and reading the content of published blog posts, we determined whether each blog satisfied the requirements of the study. The collected samples were then subjected to an initial screening to confirm that the blog link was correct, the blogger was a teacher, the URL was valid, and sufficient information for the study's purposes was available. We initially collected 192 teachers' blogs. We excluded 27 blogs that did not meet the mentioned criteria, resulting in a final sample size of 165 blogs.

Procedure

During data collection, we first performed a brief analysis of the BSPs used by teachers. We then searched for teachers' blogs on these BSPs that met the criteria of this study. After collecting the data, we first performed a criterion analysis and then used factor analysis to identify the crucial factors influencing teachers' use of blogs. We then divided the teachers' blogs into groups according to the results of cluster analysis. After grouping, we used content analysis to understand the distinguishing features of each group of blogs.
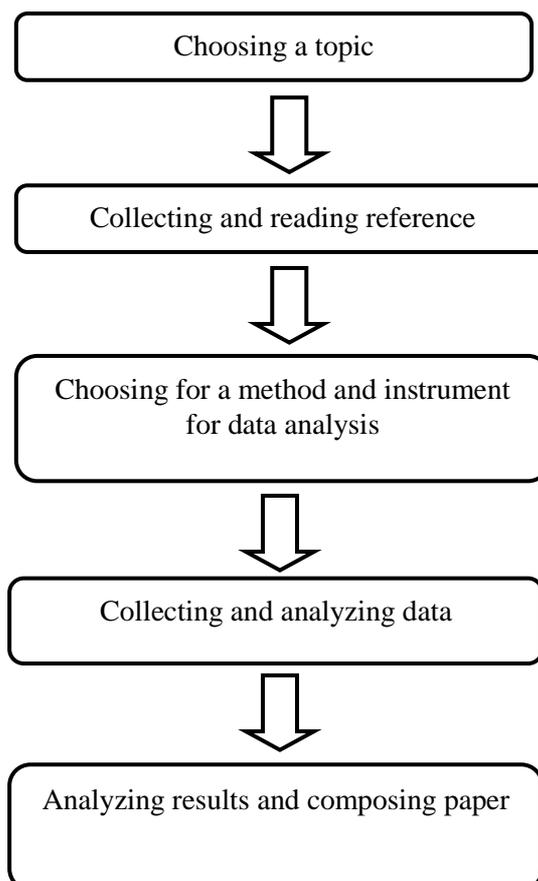
Instrument

In this study, Blog Look was used as a research tool for calculating various blog-related indicators. To perform the calculation, users need only enter the URL of the blog to be monitored. We used the index score, influence score, and page score as standard indicators.

To confirm the validity of these indicators, we divided Blog Look's 300 most popular blogs into three groups of 100 blogs each. We used tests to determine whether there were differences (index score: t = 15.03***; influence score: t = 8.71***; page score: t = 9.31***) between the groups of blogs ranked 1–100 (index score: M = 3,761.45，SD = 727.45; influence score: M = 5,496.64，SD = 4,367.12; page score: M = 96,201.97，SD = 71,757.41) and 201–300 (index score: M = 2,538.81，SD = 354.91; influence score: M = 1,627.10，SD = 676.08; page score: M = 27,684.35，SD = 14,492.80). We determined that all indicators provided by Blog Look could distinguish effectively between the highest- and lowest-ranked groups. We then used the top 100 blogs to verify the validity of these indicators (index score: t = 9.98***; influence score: t = 5.54***; page score: t = 5.10***), and compared the blogs ranked 1–33 (index score: M = 4,451.91，SD = 602.26; influence score: M = 7,638.03，SD = 4,010.77; page score: M = 135,524.91，SD = 78,589.04) with those ranked 66–100 (index score: M = 3,207.17，SD = 400.12; influence score: M = 3,534.97，SD = 1,464.06; page score: M = 61,006.23，SD = 30,183.62). The index score, influence score, and page score were distinguished between the high- and low-ranked groups, indicating that these three indicators are the most stable.

We adopted the index, influence, and page scores for this study. Page score is closely related to the total number of posts on a blog and the number of page views. The index score is directly related to post quality. The influence score is susceptible to the choice of BSP. Figure1 presents a chart of the study process.

Figure1. Study Process

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┌─────────────────────────────────┐
│          Choosing a topic        │
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                 ⇓
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│   Collecting and reading reference│
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                 ⇓
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│  Choosing for a method and instrument │
│        for data analysis         │
└─────────────────────────────────┘
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┌─────────────────────────────────┐
│    Collecting and analyzing data │
└─────────────────────────────────┘
                 ⇓
┌─────────────────────────────────┐
│  Analyzing results and composing paper │
└─────────────────────────────────┘
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Descriptive Statistics of Teachers' Use of Blogs

Blog service providers (BSP)

The analyzed blogs were divided into two categories according to whether they were hosted by a BSP or established by the teachers themselves. The blogs in the present sample utilized 16 BSPs (Table 1). The category "other" in Table 1 indicates that the BSP could not be determined.

Distinguishing between users of BSPs and independently established blogs revealed

that 126 teachers utilized a BSP, the most popular being Yahoo!, followed by Wretch. Table 1 shows the high number of available BSPs. A total of 39 users established their own blogs, most of which were created using LifeType, followed by KM. Recent promotional activities by LifeType in some cities and counties in Taiwan have indicated its popularity with the users who established their own blogs. Fewer people used a self-established blog, possibly because of the technical expertise and equipment required to establish, maintain, and upgrade a system.

Grade level

As shown in Table 2, most of the blogs in this study were written by primary school teachers, followed by junior high school teachers. This may be because the content in blogs by primary school and junior high school teachers is more pertinent to teaching, thereby enabling us to identify the bloggers as teachers. High school and university/college teachers' blog posts may be more related to their daily lives or reflections, making them more difficult to identify as teachers. We found that some elementary school teachers used their blogs for classroom or homework management, as a venue in which to share children's experiences, or as a bulletin board to communicate with parents. We also observed that numerous kindergarten teachers keep blogs to share events at school and their students' small accomplishments with parents.

Table 1

Blog Service Providers Used by Teachers

Blog category	Name	Number of blogs
	Yahoo!	42
	Wretch	27
	Le Duo	16
	Xuite	13
	Blogger	12
Blog service provider	Pixnet	5
	KM	4
	PChome	2
	Udn	2
	NOWNews	2
	Sina	1
	TOTAL	126
	LifeType	26
	Bo-blog	4
	WordPress	2
Self-set-up	F2blog	2
	Pjblog	1
	Other	4
	TOTAL	39

Table 2

Grade Levels Taught by the Authors of the Analyzed Blogs

Grade level	Number of teachers
Kindergarten	11
Primary	79
Junior High	36
High School	29
College/University	10
Total	165

Links

The term "links" in this paper refers to external addresses or URLs added by ablogger. As shown in Table 3, most of the blogs (80%) provided 20 or fewer external links. Three blogs included more than 100 links: Athena's World, XuanLang Blog, and Yashan's Sky. Yashan's Sky provided the highest number of links, with a total of 167. Most of these links functioned to provide teaching resources and share teaching experiences. Generally, the links in a blog are selected by its author, and if the links are useful or interesting to readers, they might add them to their own blogs. Some users link to other teachers' blogs, whereas others link only to teaching tools and resources (such as the Ministry of Education and teaching resource networks). By analyzing the links on a particular blog, we determined the topics or fields in which the user is interested.

Table 3

Number of Links to Other Teachers' Blogs

Link count	Number
0-20	132
21-40	22
41-60	3
61-80	3
81-100	2
101-120	2
120-140	0
141-160	0
161-180	1
Total	165

Article category

Blogs permit their authors to classify each posting according to their preferences. We analyzed the total number of categories listed on each blog. As shown in Table 4, most of the blogs had less than 10 categories, whereas only a few had more than 20. The blog with the highest number of categories for posts was "Production Blog Blogger." This blog's

classification of posts was extremely meticulous; perhaps the published posts were exceptionally diverse or the blogger had extensive knowledge of the contents of the posts. In addition, this blog used tags for classification instead of a more rigid classification approach.

Table 4

Number of Article Categories in Teachers' Blogs

Article categories	Number of blogs
0-10	95
11-20	56
21-30	10
31-40	3
40 or more	1
Total	165

Total number of posts

As shown in Table 5, most of the blogs had published less than 200 posts. Only three blogs included more than 1,200 posts: Teacher Sulan's Chinese Language, Happy Heaven, and Polo Daily. Of these, Happy Heaven offered the most posts, with 2,253. Reading this blog revealed that the blogger expended substantial effort into documenting his teaching. The blog's various posts included students' homework, the author's own notes, and communication with parents. This variety in content may explain the unusually high number of posts. In addition, the blog has been online since October 2005, and the blogger has published more than 2,000 posts over a period of 3 years, or more than 50 posts each month.

The list of Teacher Sulan's posts revealed this teacher's interests in movies and other activities. This blogger also paid considerable attention to teaching, as indicated by the number of published posts on his or her blog. Another blogger, Polo Daily, frequently postedcontent involving images, and the posts mostly exhibited a strong comedic style. Overall, these blogs with extremely high numbers of posts demonstrated the bloggers' continual hard work and personal style.

Table 5

Distribution of the Number of Total Posts on Teachers' Blogs

Number of posts	Number of blogs
0-100	69
101-200	34
201-300	26
301-400	12
401-500	8
501-600	7
601-700	2
701-800	2
801-900	1
901-1000	1
1001-1100	0
1101-1200	0
1201-1250	1
1251-1300	1
2000or more	1
Total	165

Index score.

According to Blog Look's definition, the index score is obtained by summing the log values of Google searches, Google links, Yahoo! links, blogger searches (link + URL), and Technorati. Table 6 shows the index scores of 165 teachers' blogs. Most of the index scores were less than 200. Only four blogs' index scores were higher than 1,000 points. The blogs with the highest score were Youngbibi Young 37 and a Half Degrees. The focus of this blog was image processing education. The blogger was an expert in image processing software and the author of many detailed instructional articles. Thus, he hada highnumber of readers.

Influence score

According to Blog Look's definition, the influence score is calculated as the square root of the sum of Google searches, blogger searches, and Technorati, multiplied by Yahoo! links. The influence scores of the studied blogs were in the same range as their index scores, with most of them being less than 200 points. In total, 155 blogs (Table 7) had influence scores of less than 400 points. Four blogs had influence scores of more than 1,000 points: Xianshi Image Record (score: 1,325), Youngbibi Young 37 (score: 2,186), Meet Peter Pan in the Corner (score: 1,494), and Polo Daily (score: 1,506). Of these blogs, Youngbibi Young 37 and Polo Daily also showed high index scores, whereas Xianshi Image Record and Meet Peter Pan in the Corner showed high influence scores only. Xianshi Image Record was a professional photography blog in which the blogger explained photographic equipment and techniques. Meet Peter Pan in the Corner was written by a junior high school Chinese language teacher, who shared his teaching experiences. He was a creative teacher, and his blog included lesson plans and teaching activities.

Table 6

Distribution of the Index scores of Teachers' Blogs

Index score	Number of blogs
0-200	137
201-400	8
401-600	9
601-800	4
801-1000	3
1001-1200	0
1201-1400	1
1401-1600	2
1601-1800	0
1801-2000	0
2001or more	1
Total	165

Table 7

Distribution of the Influence Scores of Teachers' Blogs

Influence score	Number of blogs
0-200	149
201-400	6
401-600	1
601-800	3
801-1000	2
More than 1000	4
Total	165

Page score

According to Blog Look's definition, the page score is calculated as the sum of Google searches, Google links, Yahoo! links, blogger searches, and Technorati. Most page scores, 84.2% in our sample, were less than 1,000 points. As shown in Table 8, there is substantial variation in the page scores of our study sample. In particular, seven blogs scored over 10,000. Of them, four showed high scores for the previous two indicators. Blog content analysis indicated that these blogs were oriented more toward the public. For example, Sunghsi's Study Log contained posts about the Changhua area's historical cultural sites, major events, travel, the blogger's mood, and computer-related knowledge. Hence, itsvariety attracted diverse readers.

Table 8

Distribution of the Page Scores of Teachers' Blogs

Pagescore	Number of blogs
0-1000	139
1001-2000	7
2001-3000	6
3001-4000	2
4001-5000	0
5001-6000	1
6001-7000	2
7001-8000	0
8001-9000	0
9001-10,000	1
10,001 or more	7
Total	165

Results

Research question 1: Can the characteristics of blogs effectively divide them into unique groups?

Factor Analysis

This study conducted a preliminary analysis on eight indicators. The BSP and teaching level are classification indicators and thus were not included in the factor analysis. This study applied the number of links, the number of categories, the total number of posts, index score, influence score, and page score to analyze teachers' blogs. On the basis of these six items, this study applied factor analysis with the largest variation of an orthogonal axis to determine common factors among these indicators. Analysis of the principal components was performed by retaining the original information to identify a linear combination that could explain the variables. Rather than using factors that were more original, the goal of this analysis was to identify a few main components that could be used to explain the variables.

The eigenvalue of each factor must be greater than 1.0, and the factor loading value must be greater than or equal to 0.40.

The factor analysis yielded two factors that could be used to describe teachers' blogs (Table 9). Factor I includes the page, influence and index scores, and Factor II includes the numbers of links, categories, and published posts. Because the items of Factor I are closely related to the impact of the investigated blogs, this factor is referred to as Impact. Factor II includes items that the bloggers used to manage and share their knowledge content; this factor is called Knowledge Management/Sharing (KM/KS).

Table 9

Factor Loadings and Eigenvalues

Analyzed items	Impact	Knowledge Management /Sharing
Page score	.974	.069
Influence score	.973	.065
Index score	.845	.254
Article category	-. 061	.767
Links	.144	.595
Total posts	.162	.556
Eigenvalue	2.813	1.175
The percentage of variance explained	44.358	22.096
Cumulative percentage of variance explained	44.358	66.454
KMO coefficient	.687	

Cluster Analysis

This study applied the K-Means grouping method to perform cluster analysis, in which the input data are the factor scores resulting from factor analysis. Because two factors were identified, the high and low values of each factor generated four possibilities. Therefore, group sizes of two, three, and four were considered for cluster analysis. We found that dividing the sample into two or three groups resulted in excessive blogs in each group, and the division was insufficient for explaining the sample characteristics. Accounting for the

high and low statuses for each factor produced four possibilities; thus, this study used four groups for analysis. The grouping analysis results are summarized in Table 10.

Table 10

Summary of K-Means Cluster Analysis

	Clusters			
	Group 1	Group 2	Group 3	Group 4
Impact	-. 11	3.97	10.67	-. 08
KM/KS	-. 24	.99	-. 01	2.44
Number of blogs	148	2	1	14

The factor scores were standardized and, thus, their values ranged between −3 and 3. In some cases, the factor scores were higher than 3 or lower than−3. A scale for the factor scores was formed by dividing the factors into 11 equal parts. After the factor scores were converted into a scale, the scale was used to describe the characteristics of each group and to effectively restrict the range of factor scores higher than 3 or lower than −3.

Research question 2: What are the characteristics of individual blogger groups?

Content Analysis

Groups were identified according to their characteristics. Through cluster analysis, the sample was divided into four groups: a general group, a balanced development group, a high-impact group, and a high-knowledge management/sharing group. The following paragraphs discuss the four groups on the basis of their characteristics.

General group

The general group contained the highest number of blogs, with a total of 148. This group was characterized by scale scores of 5 on both the impact and knowledge management/sharing factors (Table 11). The performance of this group was not particularly noteworthy; the impact and KM/KS rankings were moderate, with room for improvement.

Table 11

General Group Scale Scores

Factor	Factor score	Scale
Impact	-. 11	5
KM/KS	-. 24	5

Most of the users in the general group were primary school teachers, followed by junior high school teachers (kindergarten = 11, primary = 71, junior high = 30, high school = 28, and college = 8). For example, "Fly to You, Fly Me"was the blog of a primary school teacher from Yilan County. The low total number of published posts indicated that this blog was relatively new. The main purpose of this blog was to record daily life at school, including the selection of a new name for the blogger's school, the meaning of this name, and the inventiveness in which it was created. The blog posted photos and offered readers a sense of participation. In addition to introducing the reader to campus life, it also featured interactions with students, such as teachers' daily routines, to provide the reader with a sense of comfort about activities on campus.

Another blog was "Lalala of Little Green Shoot," a primary school teacher's blog. The design of the blog attracted visitors and used handmade crafts as a theme, featuring handmade soap, rubber stamps, painting, and other crafts. The talents and taste of the blogger were obvious in the blog's design and aesthetics. Through its posts, the blogger was identified as a primary school teacher. Although the blog rarely mentioned stories from school, the handmade objects were designed for children and some of its tutorials were designed for use with schoolchildren. The blog's photographs documented children's achievements.

Balanced development group

The balanced development group received the maximum 10 points for impact and 7 points for KM/KS, both of which are relatively high scores (Table 12). Only two blogs were included in this group.

Table 12

Balanced Development Group Scale Scores

Factor	Factor score	Scale
Impact	3.97	10
KM/KS	.99	7

The blogger responsible for Meet Peter Pan in the Corner has been blogging for a relatively long time. The most prominent feature of this blog was its personal style, which could also be seen from the names used to categorize the articles. Similar to the blog's title, the categories involved using the names of characters from the story of Peter Pan. The blogger was identified as a Chinese language teacher whose creative teaching methods, special projects, and homework made the students both love and hate him. Most of the links on this blog were to other teachers' blogs. Because of its longevity, the blog had a large and loyal readership. Badges on the blog indicated that the blogger had attended blog conferences and received many awards. The blogger's relaxed and light-hearted style helped attract and retain numerous readers.

The other blog in this group is Polo Daily, which used the BSP Xuite. This blog exhibited a distinctive personal style. Its posts were mostly presented using processed images, and most of the articles contained comedic elements. The blogger rarely featured school-related articles, focusing instead on image processing and the presentation of his work. The categorization of posts revealed the blogger's continual hard work. In addition to utilizing image processing to make the posts appear in a newspaper layout, the blogger used audio and video to present his ideas, and he combined his posts with thoughts about current events to attract a wide variety of readers. The blog had been in operation for 5 years with a regular readership.

High-Impact Group

The only blog in the high-impact group is YoungBibi Yong 37 and a Half Degrees. This blog received an impact score of 10 (Table 13). Its KM/KS factor score was 5 points.

Table 13

High-Impact Group Scale Scores

Factor	Factor score	Scale
Impact	10.67	10
KM/KS	-. 01	5

This blog used the Wretch system. The main focus of this blog was to teach the reader about image processing software, and most of its posts were intended for teaching. When the blog first started, the blogger used images and text in her lessons, but she recently changed to video lessons. Most posts written by the blogger were about Photoshop and PhotoImpact software as well as travel. The blogger kept her lessons current, offering new classes when new software was released. The blogger sometimes shared personal information so that the readers could feel integrated into her personallife. The impact of this blogger was shown not only by the popularity of her posts but also by the books she had published, which were displayed as badges on the blog. These books were extended and modified from material that originally appeared on the blog.

High-knowledge management/sharinggroup

Table 14 lists the scores of the high-knowledge management/sharing group. The impact score is slightly less than the average score of 4 points, but the KM/KS factor score is relatively high at 9 points. This group included 14 blogs. Most bloggers in this group were primary school teachers (kindergarten = 0, primary = 8, junior high =4, high school = 1, and college = 1).

Table 14

High-Knowledge Management/Sharing Group Scale Scores

Factor	Factor score	Scale
Impact	-. 08	4
KM/KS	2.44	9

The high-knowledge management/sharing group included the Frog Log, which uses the Xuite System. The blogger explained his love of photography in his introduction: "Accustomed to the view through the viewfinder, capturing all the details through the aperture." There was also a travel category. In addition, the blogger expressedan interest in insects, cats, dogs, and flowers. A life and hobbies category was also present. The blogger expended effort to collect valuable and relevant links, some of which were photography-related, whereas others were related to his feelings about life.

A second example is Yichanlin, which used the Wretch system. The blogger described his interest in education and academic concerns, and the posts were mainly related to education. The detailed categorization system included categories for reading education, newspaper reading education, creative teaching, writing instruction, language teaching, and travel or study experiences. According to the web link page, the blogger clearly took great care in managing the links on his blog. The regularly visited links were categorized into math websites, writing education websites, high-quality teaching blogs, and teaching resources. Hence, considerable time and energy are necessary to collect and read such web resources.

Discussion and Conclusion

The main purpose of this study was to analyze the use and management of teachers' blogs by using quantifiable indicators. By considering the number of posts, number of links, page score, number of article categories, index score, and influence score, we performed a genre analysis of a sample of blogs written by teachers. Using factor analysis and cluster analysis, we identified two factors that affect teachers' use of blogs: impact and knowledge management/sharing. By applying these two factors and the cluster analysis results, this study divided the sample of blogs into four groups: a general group, a balanced development group, a high-impact group, and a high-knowledge management/sharing group. Among these groups, the outstanding, high-impact and high-knowledge management/sharing groups demonstrated prominent performance. However, the general group was the largest, and it exhibited the potential to further develop in the future. In Hou, Chang, and Sung (2009, 2010), content analysis revealed that most teachers' blogs in Taiwan often express personal experiences and emotion; however, the depth and diversity of teachers' knowledge-construction of teaching-related knowledge is limited. Moreover, the content of

teachers' blogs is mostly irrelevant to teaching (Hou, Chang & Sung, 2010). These limitations may also affect the in-depth knowledge sharing in teacher blogs. In this study, most teachers' blogs were placed in the general group, thus indicating limited knowledge sharing between teachers (e.g., Carroll et al., 2003; Tyack & Cuban, 1995).

On the basis of our findings, we offer the following suggestions for teachers and teacher educators. Authors of education-related blogs may refer to the characteristics of the four groups when deciding how to operate their blogs. Moreover, teacher-trainers could applyour findings to formulate ICT-Integration training. These courses could then help teachers maximize the use of blogs for teaching or professional development. For example, the training could involve conducting blog-visiting/sharing activities according to the results of our grouping. The bloggers in the general group could learn from bloggers in the other three groups about improving their knowledge-management/sharing skills and promoting their impact. They could learn about the management of blogs according to excellent examples and thus improve the visibility of their own blogs. They could also attract more readers by improving their writing. Influences and knowledge sharing that are more favorable may also increasethe depth and breadth of knowledge sharing in the teacher community.

In comparing the analytical results of our present study to those of the Chang and Liu (2008) pilot study; we found that the grade level that the bloggers taught ranged from kindergarten to the college/university level. In the factor analysis, the total number of posts was classified as a knowledge-management/sharing factor, thereby rendering the results more reasonable. As in the pilot study, our cluster analysis identified four groups; however, the newly identified groups did not match the previous groups of high-management, high-impact, novice, and veteran. The results of this analysis may be influenced by the advanced experience of teachers' use of blogs. The more teachers there are who can manage blogs adequately, the higher the impact their blogs will have, thereby separating them from the group of general bloggers. Thus, research on teachers' use of blogs should account for the impact of time. To improve our understanding of the effect of the passage of time, future research should include a larger-scale analysis involving the factor of time.

Future research could use our method of categorizing blogs to increase the speed and accuracy of grouping rather than conduct a new cluster analysis for every sample. Furthermore, the differences between individual blogs in each group were not investigated in the present study. In the future, we could perform differential analysis according to the

differences between teachers' blogs. A quasi experimental design could be used to examine the impact of personality on the categories and quality of published posts. Conducting an information-sharing session with teachers would enable performing more content analyses to identify the genre and quality of teachers' posts, toward the goal of eventually establishing a coding scheme for the information contained in teachers' blogs.

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以集群分析進行臺灣教師使用及管理部落格的方式之研究

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摘要

隨著 Web 2.0 的升級，全新的網路工具也因運而生，例如部落格。本研究將採取因素分析、集群分析及內容分析法針對 165 個樣本數進行分析，研究目的旨在了解臺灣教師使用及管理部落格的方式及形態。研究者提出六項指標（包含總發文數量、文章分類、聯結、頁數、檢索數及影響數）將教師的部落格進行分類。接著，運用因素分析找尋影響教師使用部落格的因素。而後使用集群分析將同質性高的部落格分為一類，研究發現臺灣教師部落格的類型大致可分為四種：一般、凸出、高影響力及高度傳遞知識等類型。最後，再使用內容分析法，分析以上四種類型，說明使用部落格的好處，並且給臺灣教師及教育家一些使用部落格的建議。

關鍵字：部落格、教師社群、內容分析法、專業發展、集群分析

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