Using Quantitative Analysis to Identifying a General Structure of Teachers' Online In-service learning

Lung-Hsing Kuo, Chin-Hsi Chen, Hung-Jen Yang,and Li-Ming Chen

Abstract—
Quantitative analysis is the process of presenting and interpreting numerical data. With the rise of internet technologies, distance courses have migrated to the Web, teachers can spend their time to study in-serve teacher advancement education online. This study aims to identifying a structure of in-service teachers studied online related courses of in-service teacher advancement education in Taiwan by using quantitative analysis. The results shows there are real relationships between course type and first registered specialty, course type and school level, and course type and age group for teachers used online learning to study related courses of in-service teacher advancement education. The result shows teachers who study course type of teaching or administration category can be divided into two groups.

Keywords—General Structure, In-service, Professional Development, Teacher Education,

I. Introduction

Teachers are professionals should change with the environment, enhance their professional abilities and to give students a better quality of education. When teachers have more professional knowledge, they can be able to offer more study opportunities for students[1]. Today's classroom teachers must be prepared to provide technology-supported learning opportunities for their students. Being prepared to use technology and knowing how that technology can support student learning must become integral skills in every teacher's professional repertoire. The Education Information Network in the European Union (EURYDICE) defines in-service training as 'a variety of activities and practices in which teachers become involved in order to broaden their knowledge, improve their skills and assess and develop their professional approach' [2]. It is a key factor in influencing the professional development of teachers and contributing to the improvement of their knowledge through an active role [3]

In order to enhance teacher quality, Teacher Education Act and Teacher-Law are provided legal basis of in-service advancement education for teachers and life-long learning and on-the-job training has become the important subjects in education reform. In-service teacher advancement education is help teachers to enhance teachers' professionalism and specialized knowledge of courses so that the overall quality of education is elevated. That is providing opportunities for professional growth, the possibility of continuing study and improving teaching knowledge of teachers. However, with the rise of internet technologies, distance courses have migrated to the Web where it is possible to incorporate online learning as a primary component of the course. Distance education provides one means of integrating technology across teacher preparation to meet the growing needs of pre-service and in-service preparation programs [4]. Today, teachers can spent their time to study variety of in-service advancement education courses not only at schools, In-service teacher advancement education agencies, Universities with teacher education, Universities without the department of teacher education, Life-long learning organizations and also can study online[5],[6].

This study aims to find structure base on profile (age group, first registered specialty, school level, and course type) of in-service teachers studied online related courses of in-service teacher advancement education in Taiwan.

A. Aim of the Study

The research goals in this study are:

- Is there any relationship between course type and age group?
- Is there any relationship between course type and first registered specialty?
- Is there any relationship between course type and school level?
- To find the general structure based on profile (age group, first registered specialty, school level, and course type) of in-service teachers studied online related courses of in-service teacher advancement education

B. Definition of Terms

- **In-service teachers**: Refer to full-time teachers with teaching certificates serving in public and private K-12 schools.
- **School level:** Refers to the present-day school education system, such as: preschool, primary schools, school, junior high school, senior high school, senior vocational school, special education school, and juvenile correctional school (supervised by Ministry of Justice).

- **First registered specialty:** Refers to the specialty in the subject field of certain school level related to the major officially registered on the first teaching certificate by the trainee teacher after completing the teacher training program.
- **Course type:** Refers to the in-service teacher advancement education course either in "administration" or "teaching" or "others" category.
- **Age group:** either 22-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, or 60 above.

II. Study Design

A. Research Subjects

In this study the subjects are the teachers has been use online learning to study related courses of in-service advancement education activities and the course type either in "administration" or "teaching" in Taiwan during 2009 to 2010. We use Nationwide Teacher in-service Advancement Education Information Web (http://inservice.edu.tw/) database randomly select 3000 sample resources. The basic data analyses are shown in Table1 to Table 4.

Table 1 Number of persons/times by course type

Course type	**Number of persons/times**
Administration	817
Teaching	2183

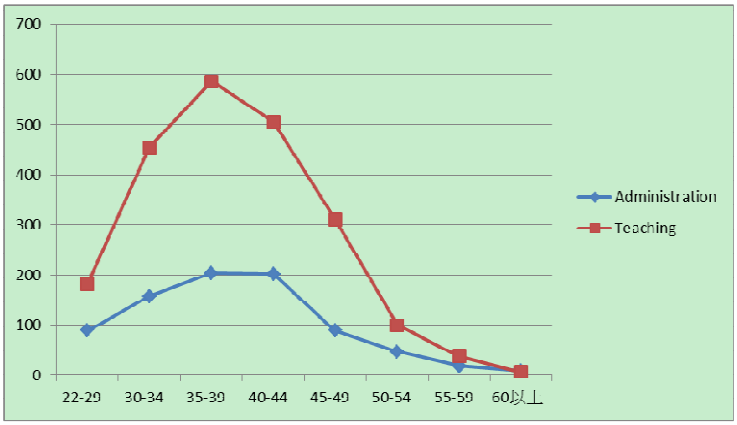

Table 2 Number of persons/times by age group

Unit: persons/times

	Course type		
Age group	**Administration**	**Teaching**	Total
22-29	89	182	271
30-34	158	454	612
35-39	204	586	790
40-44	202	505	707
45-49	89	311	400
50-54	47	100	147
55-59	19	38	57
60 above	9	7	16
Total	**817**	**2183**	**3000**

Table 3 Number of persons/times by school level

Unit: persons/times

School level	Course type		Total
	Administration	**Teaching**	
Preschool	8	51	59
Special education school	1	2	3
Senior high school	235	52	287
Vocational school	55	9	64
Junior high school	84	485	569
Primary school	434	1567	2001
Correctional school	0	17	17
Total	**817**	**2183**	**3000**

Table 4 Number of persons/times by first registered specialty

Unit: persons/times

First registered specialty	Course type		Total
	Administration	**Teaching**	
Secondary education	313	521	834
Preschool education	10	57	67
Special education	5	17	22
Vocational School education	61	44	105
Primary education	428	1544	1972
Total	**817**	**2183**	**3000**

B. Chi-square test & cluster analysis

The SPSS statistical software is used in this study. We use Chi-square test to test for the significance of relationships between variables cross-classified in a bivariate table. The variables we use as follows:

- Dependent variable: course type
- Independent variables: are age group, first registered specialty and school level.

The null hypothesis in this study is there are no relationship between course type and first registered specialty; course type and school level; course type and age group. Then, we use cluster analysis to find the mode for in-service teacher advancement education in Taiwan.

III. CHIQ-SQUARE TEST FOR TESTING THE RELATIONSHIP BETWEEN COURSE TYPE AND FIRST REGISTERED SPECIALTY.

Table 5 is the cross table for course type and first registered specialty. It shows the observed count for teachers who study course type of administration and their first registered specialty is senior vocational school education is about two times more than the expected count. Table 6 shows the chiq-square test for testing the relationship between course type and first registered specialty. We found there is a real relationship between course type and first registered specialty for teachers who participated in in-service teacher advancement education.

Table 5 Cross table for course type and first registered specialty

Course type		First registered specialty					
		Secondary	Preschool	Special	Vocational	Primary	Total
administration	Count	313	10	5	61	428	817
	Expected Count	227.1	18.2	6.0	28.6	537.0	817.0
teaching	Count	521	57	17	44	1544	2183
	Expected Count	606.9	48.8	16.0	76.4	1435.0	2183.0
Total	Count	834	67	22	105	1972	3000
	Expected Count	834.0	67.0	22.0	105.0	1972.0	3000.0

Table 6 Chi-square test for course type and first registered specialty

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.309E2	4	.000
Likelihood Ratio	123.564	4	.000
N of Valid Cases	3000		

a. 0 cells (0%) have expected count less than 5. The minimum expected count is 5.99.

IV. Testing the Relationship Between Course Type and School Level

Table 7 is the cross table for course type and school level. It shows the expected count for teachers who study course type of administration and their school level is preschool and senior vocational school are about two times and three more than the observed count respectively; observed count of high school level is about three times more than expected count for teachers who study course type of administration. The expected count for teachers who study course type of teaching and their school level are senior high school and senior vocational school is about 4 and 5 times more than observed counts respectively. Table 8 shows the chiq-square test for testing the relationship between course type and school level. We found there is a real relationship between course type and school level for teachers who participated in in-service teacher advancement education.

Table 7 Cross table for course type and school level

Course type		School level							
		Preschool	Special education school	High school	Vocational school	Junior high school	Primary school	Correctional school	Total
administration	Count	8	1	235	55	84	434	0	817
	Expected Count	16.1	.8	78.2	17.4	155.0	544.9	4.6	817.0
teaching	Count	51	2	52	9	485	1567	17	2183
	Expected Count	42.9	2.2	208.8	46.6	414.0	1456.1	12.4	2183.0
Total	Count	59	3	287	64	569	2001	17	3000
	Expected Count	59.0	3.0	287.0	64.0	569.0	2001.0	17.0	3000.0

Table 8 Chi-square test for course type and school level

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.315E2	6	.000
Likelihood Ratio	569.993	6	.000
N of Valid Cases	3000		

a. 3 cells (21.4%) have expected count less than 5. The minimum expected count is .87.

V. CHIQ-SQUARE TEST FOR TESTING THE RELATIONSHIP BETWEEN COURSE TYPE AND AGE GROUP

Table 9 is the cross table for course type and age group. It shows the expected count and observed count is about the same for the age group of teachers who study course type either in administration or teaching. Table 10 shows the chiq-square test for testing the relationship between course type and age group. We found there is a real relationship between course type and age group for teachers who participated in in-service teacher advancement education.

Table 9 Cross table for course type and age group

Course type		AgeGroup								
		22-29	30-34	35-39	40-44	45-49	50-54	55-59	60 above	Total
admi	Count	89	158	204	202	89	47	19	9	817
	Expected Count	73.8	166.7	215.1	192.5	108.9	40.0	15.5	4.4	817.0
teaching	Count	182	454	586	505	311	100	38	7	2183
	Expected Count	197.2	445.3	574.9	514.5	291.1	107.0	41.5	11.6	2183.0
Total	Count	271	612	790	707	400	147	57	16	3000
	Expected Count	271.0	612.0	790.0	707.0	400.0	147.0	57.0	16.0	3000.0

Table 10 Chi-square test for course type and age group

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.899a	7	.004
Likelihood Ratio	19.998	7	.006
N of Valid Cases	3000		

a. 1 cells (6.3%) have expected count less than 5. The minimum expected count is 4.36.

VI. CLUSTER ANALYSIS: ADMINISTRATION

This section we will focus on the teachers used online learning to study related courses of in in-service teacher advancement education for the administration course type. Table 11 shows teachers who study course type of administration category is divided into two groups. Group 1 has 432 subjects and group 2 has 385 subjects. From the Table 12 we can see for the first registered specialty, all teachers has senior vocational school education specialty is assign to cluster 1 and some teachers has preschool education specialty and correctional school specialty are also in class 1, being 20.0% and 40.0%of total preschool and correctional school education specialty respectively. The rest of the first registered specialties are assign to cluster 2. Table 13 shows for the school level, the cluster 1 contain teachers who study administration course type of in-service advancement education their school level is primary school, being 99.3% of total primary school level. Only a few teachers who study administration course type of in-service advancement education their school level is senior vocational school (1.8%). The majority of the cluster two is preschool, special education school, senior high school, senior vocational school and, junior high school level. Table 14 shows the cluster distribution for age group. We found both clusters has similar age distribution except the cluster 2 contain all teachers whose age are 60 above and teachers are in age group 55-59, being 73.7% of total 55-59 age group.

Table 11 cluster distribution for course type of administration category

		N	% of Combined	% of Total
Cluster	1	432	52.9%	52.9%
	2	385	47.1%	47.1%
	Combined	817	100.0%	100.0%
	Total	817		100.0%

Table 12 cluster distribution for first registered specialty

	First registered specialty											
	Secondary school education		Preschool education		Correctional school		Special school education		Senior vocational school education		Primary school education	
Cluster	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
1	0	.0	2	20.0	2	40.0	0	.0	428	100.0	0	.0
2	313	100.0	8	80.0	3	60.0	61	100.0	0	.0	313	100.0
Combined	313	100.0	10	100.0	5	100.0	61	100.0	428	100.0	313	100.0

Table 13 cluster distribution for school level

		Cluster		Combined
School level		1	2	
Preschool	Frequency	0	8	8
	%	0.00%	100.00%	100.00%
Special education School	Frequency	0	1	1
	%	0.00%	100.00%	100.00%
Senior high school	Frequency	0	235	235
	%	0.00%	100.00%	100.00%
Senior vocational school	Frequency	1	54	55
	%	1.80%	98.20%	100.00%
Junior high school	Frequency	0	84	84
	%	0.00%	100.00%	100.00%
Primary school	Frequency	431	3	434
	%t	99.30%	0.70%	100.00%

Table 14 cluster distribution for age group

Age Group		Cluster 1	Cluster 2	Combined
22-29	Frequency	37	52	89
	%	41.60%	58.40%	100.00%
30-34	Frequency	84	74	158
	%	53.20%	46.80%	100.00%
35-39	Frequency	117	87	204
	%	57.40%	42.60%	100.00%
40-44	Frequency	119	83	202
	%	58.90%	41.10%	100.00%
45-49	Frequency	48	41	89
	%	53.90%	46.10%	100.00%
50-54	Frequency	22	25	47
	%	46.80%	53.20%	100.00%
55-59	Frequency	5	14	19
	%	26.30%	73.70%	100.00%
60 above	Frequency	0	9	9
	%	0.00%	100.00%	100.00%

VII. CLUSTER ANALYSIS: TEACHING

This section we will focus on the teachers used online learning to study related courses of in in-service teacher advancement education for the teaching course type. Table 15 shows teachers who study course type of teaching category is divided into two groups. Group 1 has 639 subjects and group 2 has 1544 subjects. From the Table 16 we can see for the first registered specialty, all teachers has primary school education specialty is assign to cluster 2. The rest of the first registered specialties are assign to cluster 1. Table 17 shows for the school level, the majority of the cluster 1 is preschool level, special education school level, senior high school level, senior vocational school level, junior high school level, and correctional school. The cluster 2 only contain teachers who study teaching course type of in-service advancement education their school level is primary school, being 98.5% of total primary school. Table 18 shows the cluster distribution for age group. We found cluster 2 teachers with age between 35 and 49, and 60 above 5 is much higher than cluster 1 and the differences are more than 42.8%.

Table 15 cluster distribution for course type of teaching

		N	% of Combined	% of Total
Cluster	1	639	29.3%	29.3%
	2	1544	70.7%	70.7%
	Combined	2183	100.0%	100.0%
	Total	2183		100.0%

Table 16 cluster distribution for first registered specialty

	First registered specialty									
	Secondary school education		Preschool education		Special school education		Senior vocational school education		Primary school education	
Cluster	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
1	521	100.0%	57	100.0%	17	100.0%	44	100.0%	0	.0%
2	0	.0%	0	.0%	0	.0%	0	.0%	1544	100.0%
Combined	521	100.0%	57	100.0%	17	100.0%	44	100.0%	1544	100.0%

Table 17 cluster distribution for school level

		Cluster		Combined
School level		1	2	
Preschool	Frequency	51	0	51
	%	100.00%	0.00%	100.00%
Special education school	Frequency	2	0	2
	%	100.00%	0.00%	100.00%
Senior high school	Frequency	52	0	52
	%	100.00%	0.00%	100.00%
Senior vocational school	Frequency	9	0	9
	%	100.00%	0.00%	100.00%
Junior high school	Frequency	485	0	485
	%	100.00%	0.00%	100.00%
Primary school	Frequency	23	1544	1567
	%t	1.50%	98.50%	100.00%
Correctional school	Frequency	17	0	17
	%t	100.00%	0.00%	100.00%

Table 18 cluster distribution for age group

		Cluster		Combined
Age group		1	2	
22-29	Frequency	84	98	182
	%	46.20%	53.80%	100.00%
30-34	Frequency	164	290	454
	%	36.10%	63.90%	100.00%
35-39	Frequency	136	450	586
	%	23.20%	76.80%	100.00%
40-44	Frequency	106	399	505
	%	21.00%	79.00%	100.00%
45-49	Frequency	79	232	311
	%	25.40%	74.60%	100.00%
50-54	Frequency	50	50	100
	%	50.00%	50.00%	100.00%
55-59	Frequency	18	20	38
	%	47.40%	52.60%	100.00%
60 above	Frequency	2	5	7
	%	28.60%	71.40%	100.00%

VIII. Conclusions

This study aims to find structure base on profile (age group, first registered specialty, school level, and course type) of in-service teachers studied online related courses of in-service teacher advancement education in Taiwan. The conclusions are as follows:

- We found there are real relationships between course type and first registered specialty, course type and school level, and course type and age group for teachers used online learning to study related courses of in-service teacher advancement education.
- Teachers who study course type of teaching category can be divided into two groups. For the first registered specialty, all teachers has senior vocational school education specialty is assign to cluster 1 and with some teachers has preschool education specialty and correctional school; the cluster 1 contain teachers their school level is primary school, being 99.3% of total primary school level and their school level is senior vocational school (1.8%). The majority of the cluster two is preschool, special education school, senior high school, senior vocational school and, junior high school level. The cluster 2 contains all teachers whose age is 60 above and teachers are in age group 55-59, being 73.7% of total 55-59 age group.
- Teachers who study course type of administration category can be divided into two groups. For the first registered specialty, all teachers has primary school education specialty is assign to cluster 2. The rest of the first registered specialties are assign to cluster 1. For school level, the cluster 2 only contain teachers who study teaching course type of in-service advancement education their school level is primary school, being 98.5% of total primary school. We found cluster 2 teachers with age between 35 and 49, and 60 above 5 is much higher than cluster 1 and the differences are more than 42.8%.

However, we know there is some important meaning behind the classified groups we just found. Therefore a further study is required in the future.

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