

# The Age-Distributions of Teachers between Prepared without and with Computer Literacy in Taiwan

Jui-Chen Yu, Lung-Hsing Kuo, Hung-Jen Yang, and Hsueh-Chih Lin

**Abstract**— The purpose of this study was to analysis the age distribution of secondary school teachers in Taiwan. Teachers' professional is the fundamental of education, and teachers play the important role in education environment. With the time elapsed, age aging teachers. There is a problem presented that the in-service teachers must to retire and supplement continuously.

In this paper, the secondary school inclusive of junior high school, senior high school and senior vocational school. An metadata analysis method was applied in this study for exploring the age distribution of in-service teachers in secondary school, the research data would based on yearbook of teacher education statistics published from Ministry of Education, Taiwan, R.O.C. The research population is nationwide secondary school in-service teachers, 94,168 at year 2009. The research data would be divided into two parts: first registered specialty in secondary education and first registered specialty in senior vocational education.

About teachers' computer literacy preparation, the pre-service teachers had learned computer-related courses during their teacher education since 1990 to now. The proportions of teachers that had learned computer courses would be discussed.

The results of statistical analysis, normal distribution test would be used for analyzing data in this research, inclusive of skewness, kurtosis, arithmetic mean, etc., whether the age distribution is nearly normal distribution curve, or non-continuity, or generate notch, or loss of balance. And the age distribution of in-service teachers in secondary school would be presented in the conclusions of research.

**Keywords**—secondary school, in-service teachers, age distribution.

## I. INTRODUCTION

**T**eachers' professional is the fundamental of education, and teachers play the important role in education environment. With the time elapsed that the in-service teachers must to retire and supplement continuously with regular cycle.

The INTERNET connected to Taiwan in 1990 and many schools offers computer-related courses for teacher education in Taiwan. The pre-service teachers had learned computer-related courses during their teacher education since 1990 to now. So, many teachers that had learned computer-related courses would have built their computer literacy before the actual teaching.

About teachers' computer literacy, the in-service teachers with computer literacy that would assist students think creatively and analytically [1]. And computer use in classroom is also in line with constructivist approach of teaching as computer activities can be designed to be interactive and to tailor to the students' level of learning [1]. Hence, in this study, the proportions of teachers' computer literacy preparation would be discussed.

Generally recognized, novice teachers' teaching

experience is lesser than elder teachers, the middle-aged and elder teachers with full extensive experience in teaching. Novice teachers can enhance self-professional development through communicate with experienced teachers. Therefore, the novice teachers will gradually grow as a professional and experienced teacher with increased age.

Most developed world countries have accepted the chronological age of 65 years as a definition of 'elderly' or older person. At the moment, there is no United Nations standard numerical criterion, but the UN agreed cutoff is 60+ years to refer to the older population [2]. In Taiwan, In accordance with regulations, the faculty mandatory retirement age at 65 years old, or can apply for retirement before 65 years old according to individual's years of work experience.

Hence, The researcher considered that the proportions of elder teachers should be lesser than middle-aged teachers in the educational environment, by retire and supplement continuously with a certain regular proportions.

In this research, the proportions of elder teachers, the proportions of teachers' computer literacy preparation and the age distribution of secondary school teachers would be analyzed, to understand the age distribution, whether the age distribution is similar to normal distribution curve, or the age distribution generate notch, or age distribution tends to aging, or ages distribution tend to be younger. The graph of normal distribution curve as shown in figure 1.1.

A metadata analysis method was applied in this study. The research data collected from yearbook of teacher education statistics published from Ministry of Education, Taiwan, R.O.C [3]. The analysis data of secondary school teachers would be divided into two parts: first registered specialty in secondary education and first registered specialty in senior vocational education. The results of age distribution would be as the reference for teacher educational strategy development.

## II. CLASSIFICATION OF FIRST REGISTERED SPECIALTY IN SECONDARY SCHOOL

In this research, would analysis the age distribution, the research population is nationwide secondary school teachers, 94,168 at year 2009. The research group divided data of first registered specialty into two parts: secondary education and senior vocational education. About the detailed data shows as follows.

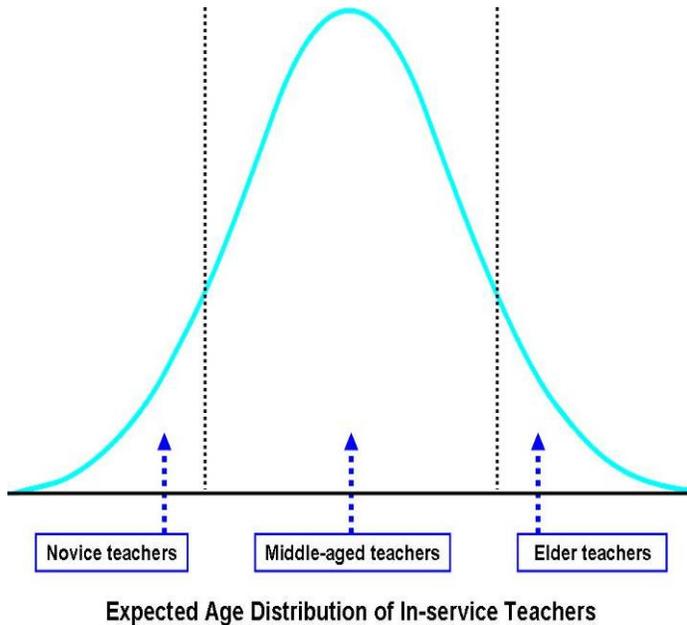


Fig. 1.1 Expected Age Distribution of In-service Teachers

*A. Classification of first registered specialty in secondary education*

In this part, the teachers' first registered specialty in secondary education indicated the teachers' first registered specialty inclusive of language field, mathematics field, science and technology field, social studies field, health and physical education field, arts and humanities field, and integrative activities field [4].

In this part, the population is 81,283 at year 2009. The graph of classification of first registered specialty in secondary education as shown in figure 2.1.

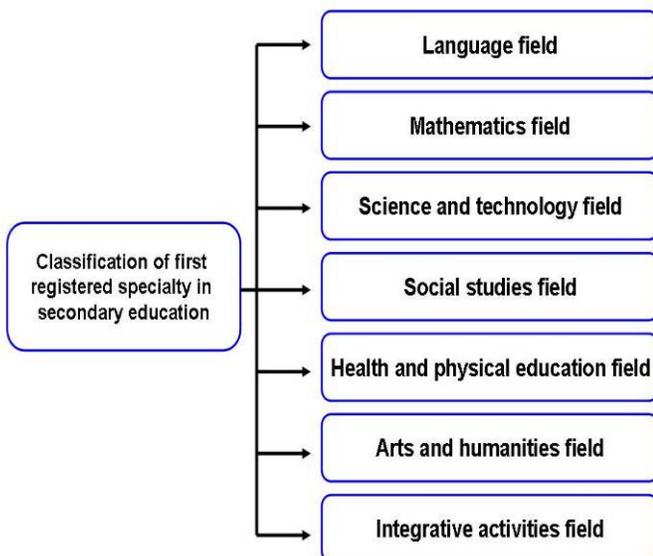


Fig. 2.1 Classification of first registered specialty in secondary education

*B. Classification of first registered specialty in senior vocational education*

In this part, the teachers' first registered specialty in senior vocational education indicated the teachers' first registered specialty inclusive of industry field, commerce field, agriculture field, home economics field, marine products field, and opera and arts field [4].

In this part, the population is 12,885 at year 2009. The graph of classification of first registered specialty in senior vocational education as shown in figure 2.2.

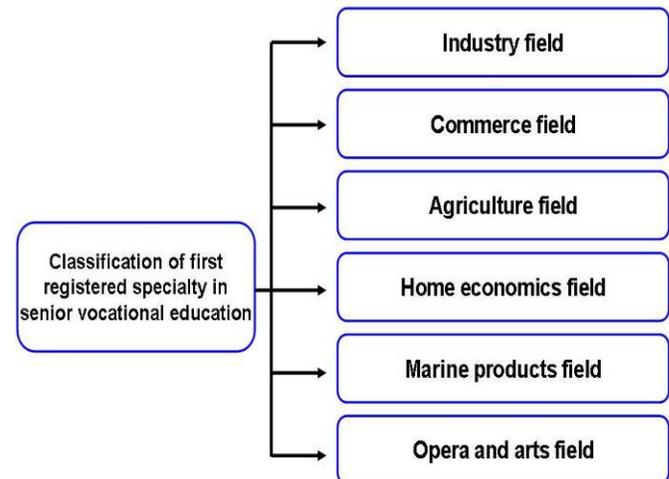


Fig. 2.2 Classification of first registered specialty in senior vocational education

III. PROBLEM SOLUTION

In this session, the research methodology, research tools, and statistical analysis are reported. The findings are also presented as follows.

*A. Methodology*

A metadata analysis method was applied in this study for exploring the age distribution of secondary school teachers. In this research, the age data of in-service teachers based on the 2009 Yearbook of Teacher Education Statistics published from Ministry of Education, Republic of China (published at august 2010). The research population is nationwide secondary school teachers, total 94,168 at year 2009.

*B. Research Tools*

In this research, the meta-data analysis as the research tool in this research. And the data structure is listed as followings:

- Name of the first registered specialty
- Distribution of age group
- Number of teachers
- Average of age

All the research data was based on the yearbook of teacher education statistics and the yearbook would be published by the

Ministry of Education, Taiwan, R.O.C. So this tool and data collected are accurate and effective.

### C. Statistical Analysis

Normal distribution test are used for analyzing data in this research, inclusive of skewness, kurtosis, arithmetic mean. And the proportions of novice, middle-aged, elder teachers would analyzed. The hypothesis was defined for testing.

- *Hypothesis 1*

*The age distribution of In-teachers' first registered specialty in secondary education and in senior vocational education reveals no significant difference.*

- *Hypothesis 2*

*The age distribution of each classification of In-teachers' first registered specialty in secondary education reveals no significant difference.*

- *Hypothesis 3*

*The age distribution of each classification of In-teachers' first registered specialty in senior vocational education reveals no significant difference.*

Based on three hypotheses were set for statistical test. The test result of the first hypothesis would provide the answer about whether the age distribution of In-teachers' first registered specialty in secondary education and in senior vocational education reveals no significant difference. If not, what is the difference?

The test result of the second hypothesis would provide the answer about whether the each classification of In-teachers' first registered specialty in secondary education reveals no significant difference. If not, what is the difference?

The test result of the third hypothesis would provide the answer about whether the each classification of In-teachers' first registered specialty in senior vocational education reveals no significant difference. If not, what is the difference?

### D. Findings

The results of statistic are presented as follows, inclusive of: descriptive results and hypothesis test results.

- *Descriptive Statistics results*

- 1) The proportions of elder teachers in secondary school

About the proportions of age group, the researcher considered that the proportion of elder teachers should be lesser than middle-aged teachers in the educational environment. About the data coding, if the teacher's age over 60 refer to elder teachers. The statistics results of age distribution inclusive of each age group proportions, the proportions of elder, were listed in Table 1 and 2.

Table 1 shows the proportions of each age group of teachers' first registered specialty in secondary education, and the proportions of elder group are around **0.511%-1.53%**. The proportion of elder teachers is lesser than other age group in secondary education.

Table 2 shows the proportions of each age group of teachers' first registered specialty in senior vocational education, and the proportions of elder group are around **0.44%-1.61%**. The proportion of elder teachers is lesser than other age group in senior vocational education.

- 2) The proportions of teachers' computer literacy preparation in secondary school

About the proportions of teachers' computer literacy preparation in secondary school, if the pre-service teachers had learned computer-related courses during their teacher education since 1990 to now. Teachers had built their computer literacy before the actual teaching. About the data coding, if the teacher's age less than 40 refer to group 1, and the teacher's age more than 40 refer to group 2.

The group 1 means that teachers had learned computer courses during their teacher education. The group 2 means that teachers had not learned computer courses during their teacher education. The statistics results of group1 and group 2 were listed in Table 3 and 4.

Table 3 shows the proportions of teachers' computer literacy preparation in secondary education, and the proportions of group1 are around **50.34%-63.52%**.

Table 4 shows the proportions of teachers' computer literacy preparation in senior vocational education, and the proportions of group1 are around **24.44%-57.50%**.

Table 1 the proportions of each age group of teachers' first registered specialty in secondary education

ITEM	Age Group								the proportions of elder teachers
	22-29	30-34	35-39	40-44	45-49	50-54	55-59	60+	
Secondary Education	13.64%	21.63%	19.08%	18.35%	14.49%	8.23%	3.40%	1.16%	<b>1.16%</b>
Language field	15.03%	20.09%	18.67%	18.42%	15.01%	8.70%	3.1%	0.90%	<b>0.90%</b>
Mathematics field	12.59%	20.92%	16.82%	20.45%	15.74%	8.54%	3.60%	1.31%	<b>1.31%</b>
Science and technology field	9.80%	23.40%	19.64%	20.84%	15.91%	7.11%	2.43%	0.84%	<b>0.84%</b>
Social studies field	16.20%	22.77%	19.52%	17.62%	12.93%	6.96%	2.99%	0.98%	<b>0.98%</b>
Health and physical education field	12.87%	23.13%	21.30%	16.43%	11.70%	8.42%	4.41%	1.70%	<b>1.70%</b>
Arts and humanities field	12.97%	25.93%	24.61%	16.09%	11.49%	6.35%	2.02%	0.511%	<b>0.511%</b>
Integrative activities field	18.52%	23.96%	19.87%	12.53%	12.38%	7.60%	3.57%	1.53%	<b>1.53%</b>

Table 2 the proportions of each age group of teachers' first registered specialty in senior vocational education

ITEM	Age Group								the proportions of elder teachers
	22-29	30-34	35-39	40-44	45-49	50-54	55-59	60+	
Senior vocational Education	5.98%	17.97%	19.25%	21.86%	16.98%	12.25%	4.31%	1.36%	<b>1.36%</b>
Industry field	4.88%	13.48%	15.78%	23.17%	20.93%	15.52%	4.58%	1.61%	<b>1.61%</b>
Commerce field	5.37%	22.38%	21.86%	21.44%	13.03%	9.51%	4.91%	1.45%	<b>1.45%</b>
Agriculture field	6.03%	25.15%	24.74%	13.07%	13.68%	11.67%	4.62%	1.00%	<b>1.00%</b>
Home economics field	12.24%	18.26%	22.62%	19.74%	16.21%	8.26%	2.17%	0.44%	<b>0.44%</b>
Marine products field	3.70%	10.37%	10.37%	17.77%	26.66%	26.66%	2.962%	1.48%	<b>1.48%</b>
Opera and arts field	8.75%	33.12%	15.62%	18.12%	10.6%	11.25%	1.87%	0.62%	<b>0.62%</b>

Table 3 the proportions of teachers' computer literacy preparation in secondary education

Item	Total	Group1	Group2	Proportion of GROUP1
Age		less than 40	more than 40	
Secondary Education	81,283	44,183	37,100	<b>54.35%</b>
Language field	29,513	15,880	13,633	<b>53.80%</b>
Mathematics field	11,814	5,948	5,866	<b>50.34%</b>
Science and technology field	14,397	7,608	6,789	<b>52.84%</b>
Social studies field	9,277	5,427	3,850	<b>58.49%</b>
Health and physical education field	6,384	3,659	2,725	<b>57.31%</b>
Arts and humanities field	4,107	2,609	1,498	<b>63.52%</b>
Integrative activities field	4,811	3,000	1,811	<b>62.35%</b>

Table 4 the proportions of teachers' computer literacy preparation in senior vocational education

Item	Total	Group1	Group2	Proportion of GROUP1
Age		less than 40	more than 40	
ALL	12,885	5568	7317	<b>43.21%</b>
Industry field	5583	1907	3676	<b>34.15%</b>
Commerce field	4802	2383	2419	<b>49.62%</b>
Agriculture field	497	278	219	<b>55.93%</b>
Home economics field	1560	829	731	<b>53.14%</b>
Marine products field	135	33	102	<b>24.44%</b>
Opera and arts field	160	92	68	<b>57.50%</b>

### 3) Normal distribution test results of teachers' first registered specialty in secondary school

According to age data of teachers' first registered specialty in secondary education collected from the yearbook of teacher

education statistics. About the data coding, if the teacher's age under 29 coded as 1, age around 30~34 coded as 2, age around 35~39 coded as 3, age around 40~44 coded as 5, age around 45~50 coded as 6, age around 55~59 coded as 7, and age over 60 coded as 8. Finally, recorded number of people among age

group. The results of normal distribution test inclusive of average age, arithmetic mean, skewness, and kurtosis, were listed in Table 5.

This results of statistic, all the mean are positive, the value around 3.425-3.5218, all the skewness are positively skewed, and all the kurtosis are platykurtic. And the results show all field are not the normal distribution.

About the histograms, the figure 3.1 shows the normal distribution test results of teachers' first registered specialty in secondary education and normal curve presented on histograms bottom.

And the figure 3.2 ~ figure 3.8 show the normal distribution test results of each classification in secondary education.

Table 5 Normal distribution test results of teachers' first registered specialty in secondary education

ITEM	Age	Mean	Skewness	Kurtosis
Secondary education(all)	39.09	3.425	.417	-.562
Language field	39.03	3.4149	.351	-.669
Mathematics field	39.59	3.5218	.343	-.614
Science and technology field	39.25	3.4498	.382	-.460
Social studies field	38.24	3.2028	.596	-.155
Health and physical education field	39.11	3.4243	.564	-.428
Arts and humanities field	37.84	3.1690	.598	-.155
Integrative activities field	37.97	3.2112	.634	-.426

Fig. 3.1 Normal distribution test of teachers' first registered specialty in secondary education

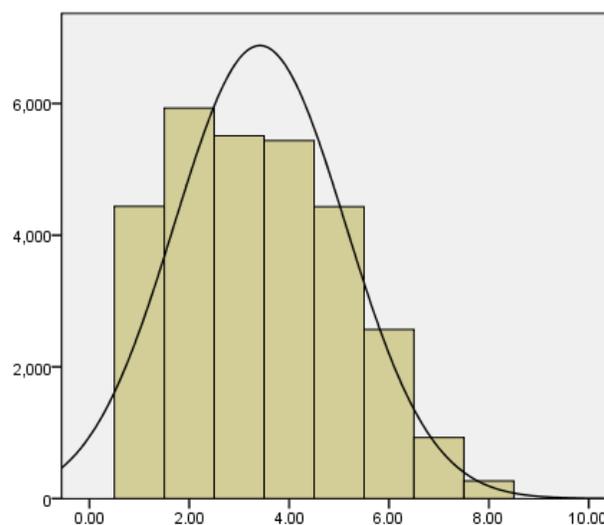


Fig. 3.2 Normal distribution test of language field

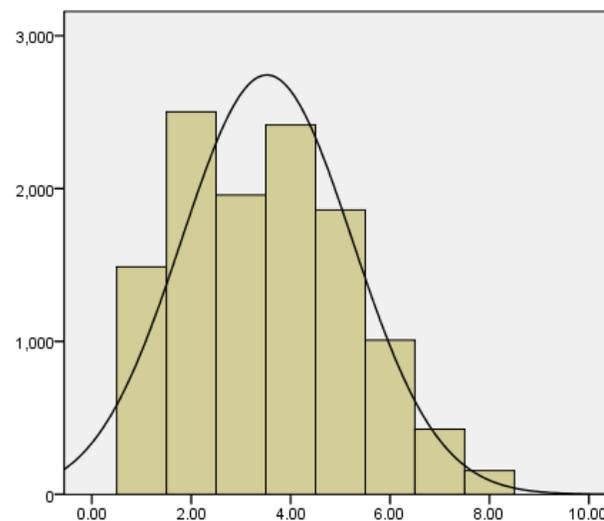


Fig. 3.3 Normal distribution test of mathematics field

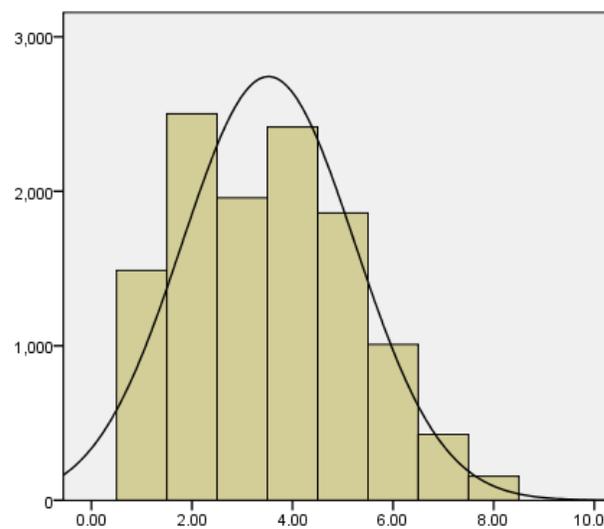
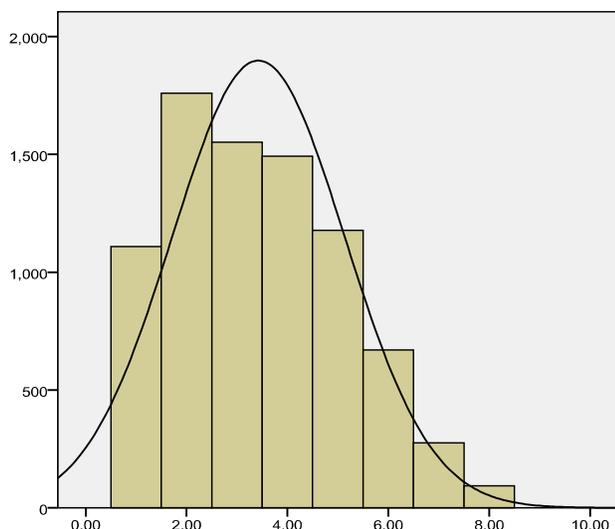


Fig. 3.4 Normal distribution test of science and technology field

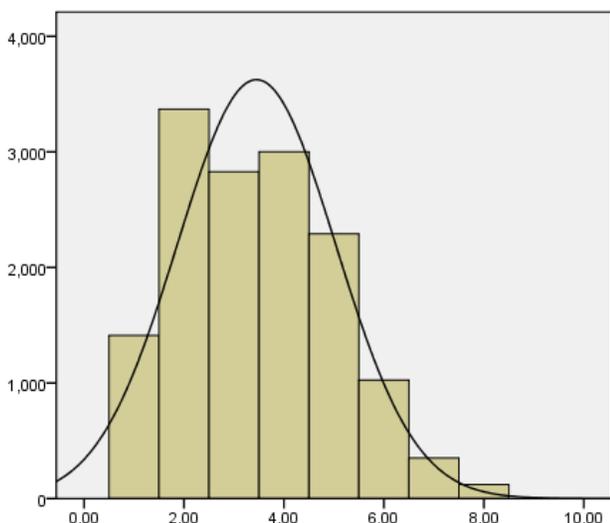


Fig. 3.5 Normal distribution test of social studies field

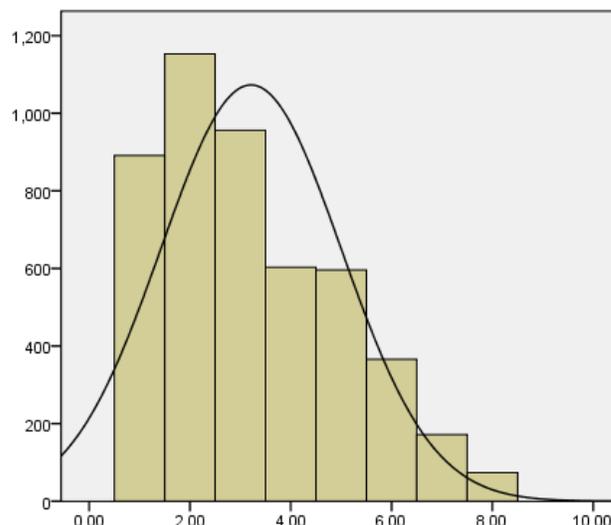


Fig. 3.8 Normal distribution test of Integrative activities field

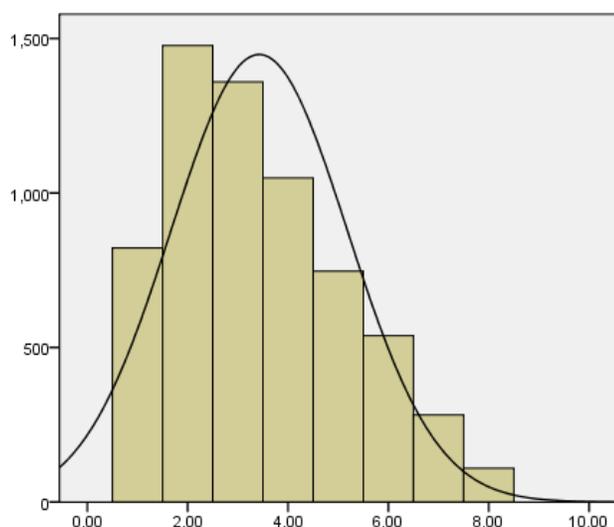


Fig. 3.6 Normal distribution test of health and physical education field

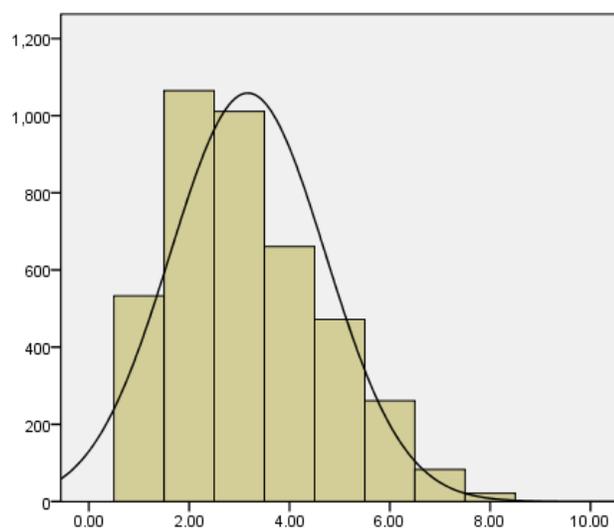


Fig. 3.7 Normal distribution test of arts and humanities field

Table 6 shows the normal distribution test results of age data of teachers' first registered specialty in senior vocational education. The results inclusive of average age, arithmetic mean, skewness, and kurtosis.

This results of statistic, all the mean are positive, the value around 3.8677-4.5259, all the kurtosis are platykurtic. In addition, the skewness value of industry field is zero, nearly normal distribution, and the value of marine products field is -0.469 is negatively skewed.

About the histograms, the figure 3.9 shows the normal distribution test results of teachers' first registered specialty in senior vocational education and normal curve presented on histograms bottom.

And the figure 3.10 ~ figure 3.15 show the normal distribution test results of each classification in secondary education. The figure 3.10 shows the normal distribution test results of Industry field and the normal curve on histograms bottom, because the value of the Skewness is zero.

Table 6 Normal distribution test results of teachers' first registered specialty in senior vocational education

ITEM	Age	Mean	Skewness	Kurtosis
Vocational education(all)	41.35	3.8677	.230	-.627
Industry field	42.78	4.1478	.000	-.594
Commerce field	40.48	3.6989	.487	-.431
Agriculture field	40.18	3.6177	.501	-.673
Home economics field	39.20	3.4519	.254	-.626
Marine products field	44.66	4.5259	-.469	-.381
Opera and arts field	38.52	3.3313	.552	-.618

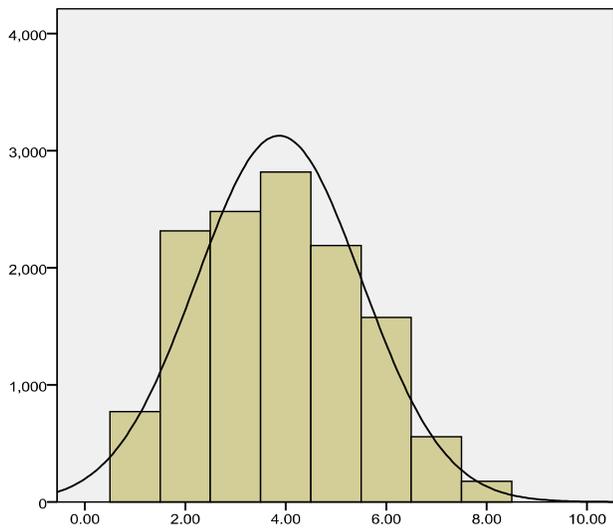


Fig. 3.9 Normal distribution test of teachers' first registered specialty in senior vocational education

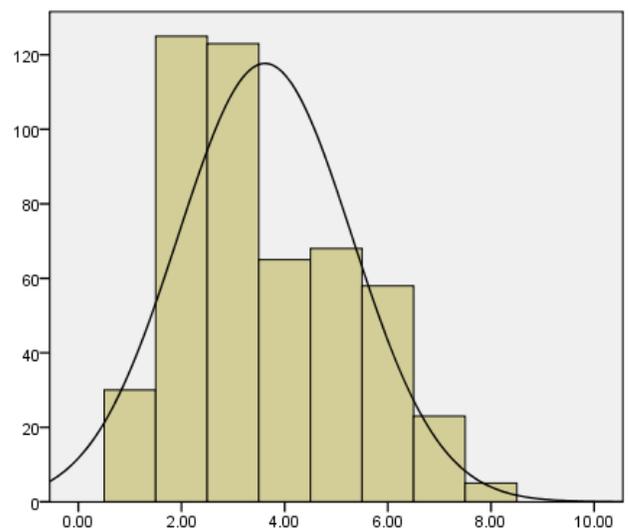


Fig. 3.12 Normal distribution test of agriculture field

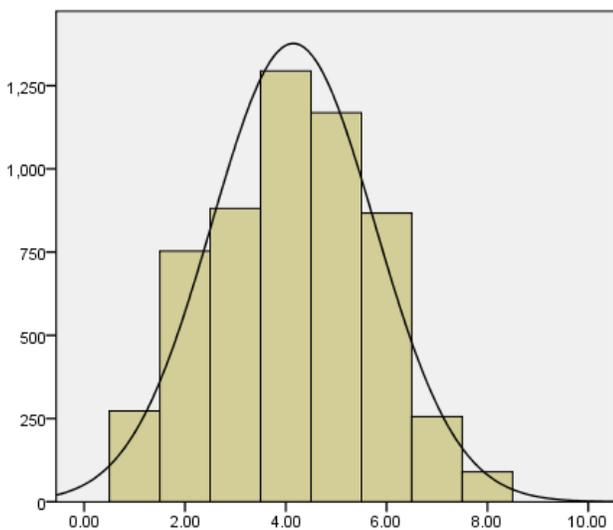


Fig. 3.10 Normal distribution test of industry field

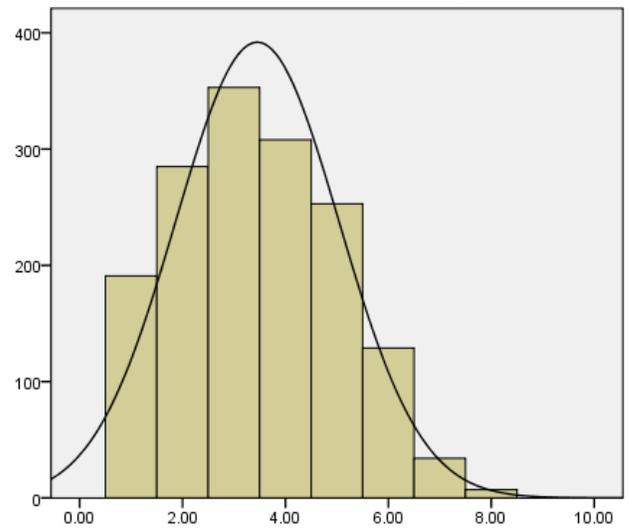


Fig. 3.13 Normal distribution test of home economics field

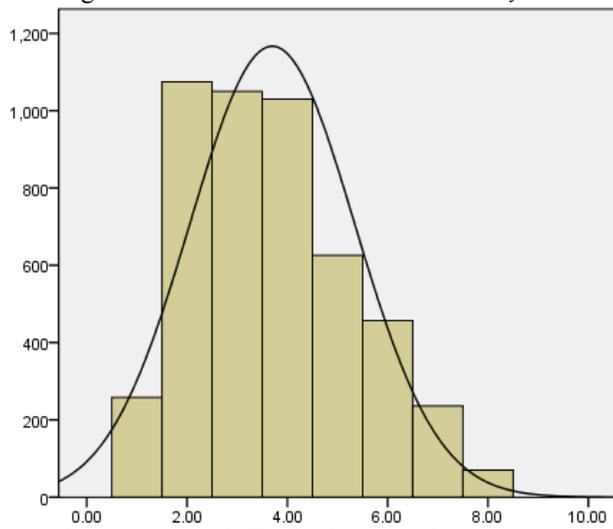


Fig. 3.11 Normal distribution test of commerce field

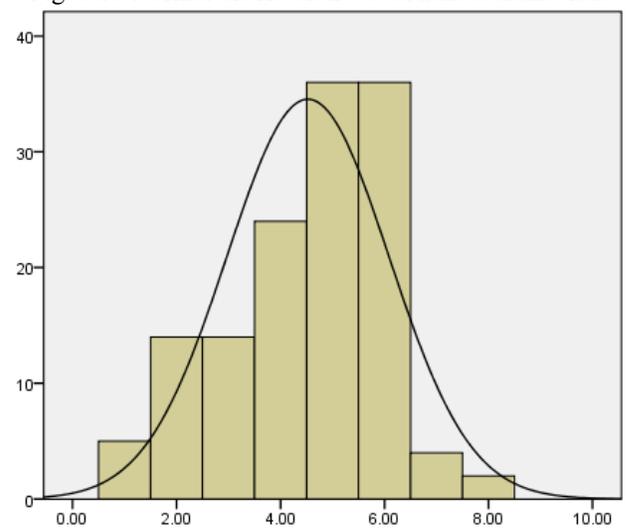


Fig. 3.14 Normal distribution test of marine products field

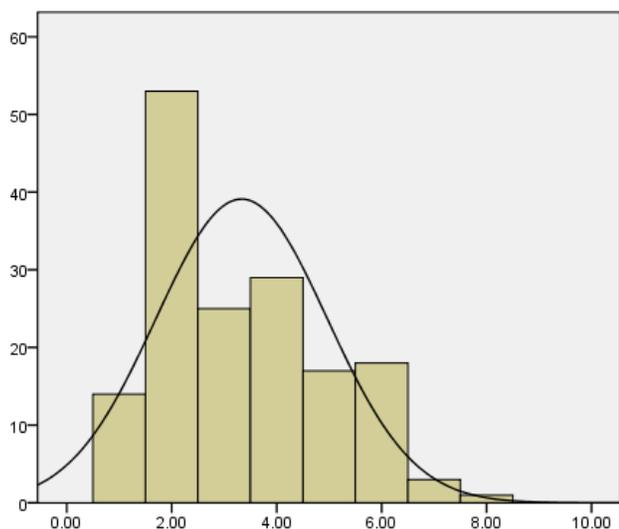


Fig. 3.15 Normal distribution test of opera and arts field

● *Hypothesis test results*

1) *Hypothesis 1*

About the age distribution of teachers' first registered specialty in secondary education and senior vocational education reveals no significant difference. The average age of each classification field were listed in Table 7. The results of

independent samples test, shows the age between secondary education teachers and senior vocational education reveals significant difference, the average age of senior vocational education teachers are significant higher than secondary education teachers. The detailed data as shows in Table 8.

2) *Hypothesis 2*

About the age distribution of each classification of teachers' first registered specialty in secondary education reveals no significant difference. The skewness of each classification field of secondary education were listed in Table 9.

The results of one-sample t test, shows the skewness of each classification field of secondary education reveals no significant difference. The detailed data as shows in Table 10.

3) *Hypothesis 3*

About the age distribution of each classification of teachers' first registered specialty in senior vocational education reveals no significant difference. The skewness of each classification field of senior vocational education were listed in Table 11.

The results of one-sample t test, shows the skewness of each classification field of senior vocational education reveals no significant difference, the detailed data as shows in Table 12.

Table 7 The average age of each classification field

General education		Vocational education	
Classification	Average age	Classification	Average age
ALL	39.09	ALL	41.35
Language field	39.03	Industry field	42.78
Mathematics field	39.59	Commerce field	40.48
Science and technology field	39.25	Agriculture field	40.18
Social studies field	38.24	Home economics field	39.20
Health and physical education field	39.11	Marine products field	44.66
Arts and humanities field	37.84	Opera and arts field.	38.52
Integrative activities field	37.97		

Table 8 Independent Samples Test Results of age average

General education			Vocational education			t
N	mean	Std. Deviation	N	mean	Std. Deviation	
8	38.7650	0.6518	7	41.0243	2.1219	-2.874*

\*p<.05

Table 9 The skewness of each classification field of secondary education

ITEM	Skewness
General education(all)	.417
Language field	.351
Mathematics field	.343
Science and technology field	.382
Social studies field	.596
Health and physical education field	.564
Arts and humanities field	.598
Integrative activities field	.634

Table 10 one-sample t test results of Skewness

One-Sample Test				
Test Value = 0.417				
General education	t	df	Sig. (2-tailed)	Mean Difference
	1.595	6	.162	.07842857

Table 11 The skewness of each classification field of senior vocational education

ITEM	Skewness
Vocational education(all)	.230
Industry field	.000
Commerce field	.487
Agriculture field	.501
Home economics field	.254
Marine products field	-.469
Opera and arts field.	.552

Table 12 one-sample t test results of Skewness

One-Sample Test						
Test Value = 0.230						
Vocational education	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
	-.057	5	.957	-.00916667	-.4249199	.4065865

#### IV. CONCLUSION

According to the results of statistic, conclusions are presented in this section. The purpose of this study was to analysis the age distribution of teachers in secondary school in Taiwan, the research data collected from yearbook of teacher education statistics. The results of research shows as follow:

- 1) The proportions of elder teachers are around **0.44%~1.61%** that are lesser than other age group in senior vocational school.
- 2) The proportions of teachers' computer literacy preparation in secondary education, and the proportions of group1 are around **50.34%-63.52%**. The proportions of group 1 of each field are more than 50%.
- 3) The proportions of teachers' computer literacy preparation in senior vocational education, and the proportions of group1 are around **24.44%-57.50%**. The proportions of group 1 of each field are inconsistent, the proportions of marine products field is lowest, and the proportions of opera and arts field is highest.
- 4) According to the results of normal distribution test, all fields are not the normal distribution. Most field of age distribution are positively skewed that shown the teachers' age distribution tend to be younger.
- 5) Based on the results of statistic, age distribution of teachers in secondary education and senior vocational education reveals significant difference. The average age of senior vocational education teachers are higher than secondary education teachers.
- 6) Based on the results of statistic, the age distribution of each classification of secondary education teachers reveals no significant difference.
- 7) Finally, based on the results of statistic, the age distribution of each classification of senior vocational education teachers reveals no significant difference.

From the results of this research, the research group found that the age distribution of teachers in secondary school are not normal distribution, but most field of age distribution are positively skewed that shown the teachers' age distribution tend to be younger. And as the researcher considered previously that

the proportions of elder teachers are lesser than middle-aged teachers in the educational environment which would be observed from Table 1 and 2. About the reason that the average age of vocational education teachers are higher than general education teachers. This issue would be left to the follow-up study.

#### REFERENCES

- [1] Abdul Razak, N., M.A. Lubis, M.A. Embi and R. Mustapha, 2010. IT literacy of language teachers in Malaysian Technical schools. *Int. J. Educ. Inform. Technol.*, 4: 149-156.
- [2] Definition of an older or elderly person. Available at: <http://www.who.int/healthinfo/survey/ageingdefnolder/en/index.html/>
- [3] Tai, Chia-Nan., Kuo, Lung-Hsing., Yang, Hung-Jen., and Wei, Huei-Mei. (2009), "Yearbook of Teacher Education Statistics The Republic of China", available at: [www1.inservice.edu.tw/Download/Edu-paper98.pdf](http://www1.inservice.edu.tw/Download/Edu-paper98.pdf) (accessed 20 July 2010).
- [4] Ministry of Education, Republic of China (Taiwan). Available at: <http://www.edu.tw/>

**Jui-Chen Yu** obtained a Master of Science in Technology Education from University of North Dakota and a Ph.D. in Industrial Technology Education from Iowa State University. She is a senior researcher at National Science and Technology Museum. Her research interests include all aspects of both museum education and technology education.

**Lung-Hsing Kuo** is the director of the center for teacher career and professional development in National Kaohsiung Normal University. He received his Master in Education (1990~1993) and Ph.D. in Education from (1993~1997) National Kaohsiung Normal University. His research interests include social Science Research Methodology, Continuing Education, Human and social, Youth Study, Emotion development and management, Counselling, and Education Issues.

**Hung-Jen Yang** is a professor in Technology Education at National Kaohsiung Normal University. He obtained a Master in Technology Education from University of North Dakota and a Ph.D. in Industrial Technology Education from Iowa State University. He is currently conducting research on knowledge transfer, and knowledge reuse via information technology. His research has appeared in a variety of journals including those published by the WSEAS.

**Hsueh-Chih Lin** received a Master (M.S.) in Industrial Technology Education from National Kaohsiung Normal University. He is a Ph.D. student in the department Industrial Technology Education at National Kaohsiung Normal University. His research is focus on both technology development and technology education.