

## The specific practice of the *Last Mile* project at Taiwanese universities of science and technology: a discussion of the different effects between *topping* and *sandwich* teaching methods from the perspective of industry

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**ABSTRACT:** The purpose of this research is to discuss how *topping* and *sandwich* teaching methods reach the appeal of the *Last Mile*, which looks at reforming technological and vocational education, from the perspective of industry, and to find out whether or not there are any significant differences. Through the research framework based on literature reviews and questionnaires, the authors investigated 500 large service industries published by *Tienxia Magazine*, from which 206 valid samples were received. By using SPSS statistical software, the authors identified descriptive statistics and conducted an independent samples t-test, a paired sample t-test and a one-way ANOVA. The research results revealed there to be significant differences between the *topping* teaching method and the *sandwich* one. Furthermore, the *topping* teaching method is more able to fulfil the goal of the *Last Mile* than the *sandwich* method.

### RESEARCH BACKGROUND

Sayling Wen, a well-known former Vice-President of Inventec Corporation in Taiwan, provided the idea of the *Last Mile*, a reform of technological and vocational education, which aims to combine education with industry [1]. The target of this method is to insert a new mechanism between technological and vocational universities, and industries, which could narrow the gap between academia and industries. Its ultimate goal is *being employed after graduation* [2].

The current model of cooperation between universities of technology and vocation, and industry is the so-called *sandwich* course, which is a popular rotation-system practice in academia [3]. However, in order to foster cooperation between academia and industry, this kind of teaching method has its limitations and problems. Nowadays, industry changes radically. It is hard to coordinate the needs between academia and industry. Also, there is the problem that students who undertake practical training are treated as cheap labour. That is to say, there is still a big distance for reaching the goal of the *Last Mile*, the unity of practice and theory. Regarding this, Chen brought up the idea of *topping* in the conference of *The Development of University and the Cooperation between Industry and Academia*, which was held at National Yun-Lin Technological University in December 2004. This method aims to echo the spirit of *Last Mile* posited by Sayling Wen [4]. Chen then further demonstrated this teaching method and its difference from *sandwich* courses. He tried to find a concrete method that could fulfil the objective of the *Last Mile* [4].

By analysing its content, it seems that the *topping* course and its teaching method, as well as the practice of cooperation between industry and academia, is apparently different from the traditional method. Its concrete practical method and executive steps deal particularly with the problems of the unity of practice and theory, and the myth of *grouping according to*

*competence* held by industry regarding graduates from universities of technology and vocation [5-15].

Although the basic theory of the *topping* course has been developed, how industry views it still needs actual testing. In order to prove that the *topping* course is more capable of reaching the goal of the *Last Mile* than the traditional method, the authors utilised an empirical method to analyse the different levels of efficacy between *topping* and *sandwich* courses and to determine if the *topping* course is more capable of fulfilling the spirit of *Last Mile*, as argued by Sayling Wen, thereby helping the graduates of universities of technology and vocation to *be employed after graduation*. Based on the above research background and motivation, the main research objectives were as follows:

- From the perspective of industry, the authors compared the difference of efficacy between *topping* and *sandwich* courses using a correlation analysis between the teaching methods and teaching objectives;
- The authors identified which teaching method was more capable of fulfilling the goal of the *Last Mile* by comparing *topping* and *sandwich* courses.

### LITERATURE REVIEW

#### The Origin and Meaning of the *Sandwich* Teaching Method

When the *sandwich* course originated is not clear, but most scholars agree that the *sandwich* plan was established in Scotland in 1880 as the earliest system of academia-industry collaboration [16]. In 1903, this education system spread to England, which allowed learning in colleges and practice rotation, that is to say, students spent some time studying at colleges and some time engaged in practice in industry (work placement experience) till graduation. Consequently, students could benefit by a combination of theory and practice.

*Sandwich* courses became popular after World War II and were developed in the area of high technological education [17]. Due to the various differences of the two education systems, the degree or diploma of British *sandwich* courses were obviously different from those offered at American universities or colleges. Brewer points out that if an analogy is drawn between the American experience and a model or buffet, then British courses can be seen as a monolithic *sandwich* course.

The Taiwanese version was introduced at Kaohsiung Hospitality College, which imitated the Swiss system [8][9]. Its method is that students study at their colleges for one semester and undertake practical training for the other semester. Three weeks before graduation, they engage in practical training and observation, which aims to reinforce students' professional knowledge and skills. Apparently, even though the definitions of *sandwich* teaching method are the same, how it is carried out depends on the education systems in different countries. In Taiwan, the *sandwich* teaching method aims to help students *doing by learning and learning by doing*, and to combine theory and practice. In such a teaching model, both teachers and students' theoretical knowledge is required and their practical skills are reinforced. Consequently, theoretical teaching and skill training are closely combined. Carrying out this method requires study at colleges and practice at companies in shifts of two semesters, ie study and practical training take turns [8]. This system was first seen in the fields of restaurants, hotel management and cosmetology. Students are required to study in the colleges in their first semester and then engage in practical training at hotels, restaurants and travel agencies. They can then put the knowledge learnt at the colleges into practice in the actual workplace. In the first semester of their second year, students go back to their colleges to study, review the work experience gained in their placements and learn more knowledge. In the second semester, they undertake practical training again. In this way, study and practice are implemented in shifts. It can be seen that its features lie in the close interaction between theory and practical experience; as such, it is also called the *rotation system* [18]. The introduction of any curriculum must have its background and goals, as does the *sandwich* teaching method. A literature review reveals it has four objectives, namely: putting theory into practice; increasing job opportunities; improving students' interpersonal relationships; and lowering the cost of laboratory teaching [8][14][15][19].

### The Origin and Meaning of the *Topping* Teaching Method

The term *topping* refers to ingredients on a pizza dough. It is the last step when making a pizza, which makes *topping* different from the *stuffing* in a sandwich. Around 2004, the concept of *topping* first appeared in the media and was soon further developed [4].

From the perspective of colleges of technology, in order to fulfil the goal of *Last Mile*, it is necessary to add those courses needed by industry into the curriculum and to use the *topping* teaching method for practical training. For industry, this kind of practical training may be regarded as a probation period for new employees. It can reduce the cost of recruitment and the three-month settling-in period in a typical workplace. Thus, it can help in the recruitment of suitable workers and serve in the integration of new management ideas in an enterprise. For students, since they are in the final semester or year, they gain extra knowledge, longer interaction with peers and are more mature [18]. In addition, because they are employed, their

attitude towards practical training is more serious, which is also good for their interaction with customers. Likewise, since those students are near graduation, companies are more willing to train them without reservation, which is good for reducing costs to colleges [17]. Most importantly, if students display good performance during practical training, they are usually employed by those companies where they were placed. This helps avoid the problem of grouping according to competence for graduates from colleges of technology and vocation [4].

Regarding the combination of theory and practice, the meanings of the *topping* and *sandwich* teaching methods are consistent [20]. Yet, the *sandwich* teaching method came from the active demands of industry, which wanted the practicality of theory to be reinforced; *topping* is a response to the needs of industry and disentangles the myth of grouping by job applicants' educational background.

### RESEARCH METHOD

According to research motivation, objectives and literature review, seven factors were identified that indicated the difference between the *topping* and *sandwich* teaching methods. These have been used to present the relationship between different efficacy levels of teaching and the accomplishment of teaching goals from the perspective of industry. The main research framework is shown in Figure 1.

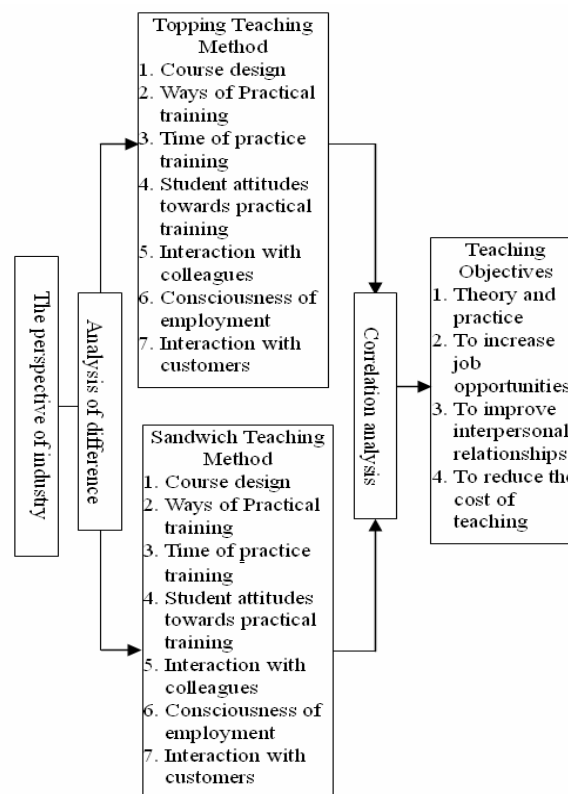


Figure 1: The research framework.

### Research Hypotheses

This research assumes that, for the interviewees from industry, there were significant differences between the four teaching objectives (theory and practice; increasing employment; improving interpersonal relationships; reducing the cost of teaching) and the seven elements of the *topping* and *sandwich* teaching methods. An empirical analysis and comparison of these two methods was then undertaken to identify which

method was closer to the spirit of the *Last Mile*, ie being employed before education and disentangling the myth of grouping by job applicants' education background [4]. Therefore, the research hypotheses were as follows:

1. From the perspective of industry, there was a significant difference between the teaching efficacy and accomplishment of the teaching objectives of the *topping* and *sandwich* methods using a correlation analysis;
2. In order to reach the teaching objectives, there was a significant difference between the *topping* and *sandwich* teaching methods;
3. Regarding the efficacy of *topping* and *sandwich* teaching methods, different industry backgrounds and attributes would result in significant differences.

## QUESTIONNAIRE DESIGN

Before designing the questionnaire, differences between the *topping* and *sandwich* methods were first investigated by way of a literature review, which identified four teaching objectives and seven different elements [21-27]. Interviews with representatives from those companies involved in the *topping* courses held by Shu-Te University were conducted to determine their attitudes towards this cooperation. Finally, the results from the literature review and interviews were assessed to confirm the four teaching objectives and seven elements of the two teaching methods, which were used as indices to design the questionnaire. The questionnaire adopted a Likert-type 5-point scale, using positive scores for assessment [28].

The questionnaire design of this research was targeted at identifying the correlation between the seven elements of the teaching methods and four teaching objectives from the perspective of industry. The four teaching objectives were used as bases to distinguish the questions. The first part covered theory and practice; the second part looked at increasing job opportunities; the third part covered improving interpersonal relationships; the fourth part tackled reducing teaching costs. There were 36 questions in total. Due to the limitations of labour, time and funding, this research targeted the 500 biggest service industries in southern Taiwan (published in *Tienxia Magazine*) as samples, with 30 of them used for the pilot test. The questionnaire feedback was then used as a reference to delete or revise some unsuitable questions so that the whole questionnaire matched the research objectives. The final questionnaires were then distributed. It had four parts: the first and second parts had 10 questions each, while the third and fourth parts had eight questions each. Utilising *SPSS* statistical software, Cronbach's  $\alpha$  was used to analyse its reliability, which was determined to be 0.84. According to Nunnally, an  $\alpha$  value of above 0.70 is the smallest value that can be accepted. Therefore, the reliability of this questionnaire reached the standard and had a very high level of reliability.

This survey was conducted between mid-November 2005 and the end of January 2006. The samples were taken from the 500 biggest service industries. So as not to repeat data, each company received one questionnaire. Therefore, 500 questionnaires were distributed. The total number returned was 216, yielding a return rate of 43.2%. With 206 of the response being valid, the valid return rate was 41.2%.

## DATA ANALYSIS

In order to reach the research objective, and according to the research framework, operational definitions and research

hypotheses, the questionnaire was designed. The main methods included descriptive statistics, an independent samples t-test, paired sample t-test and one-way ANOVA.

The authors undertook a basic analysis of the returned questionnaires in order to understand the basic features of the research samples. This research identified personal information about the interviewees in which mean and standard deviation were utilised to analyse the relationship between the four teaching objectives and seven elements of the teaching methods. Measures of the dispersion of standard deviations were then used to identify differences in the data, with a higher standard deviation value indicating larger differences. If the standard deviation was small, it meant that the interviewees' attitudes towards the importance of certain indices were more consistent. Differences in these indices were employed to determine the consistency of interviewees' attitudes towards the importance of a single index of efficacy.

This research used an independent samples t-test to analyse gender and whether the interviewees awareness of the *topping* method had any significant impact on the degree of efficacy of reaching the teaching objectives.

A paired sample t-test was used to test those sets of questions which are about seven teaching methods and four teaching objectives of *topping* and *sandwich* teaching methods. We then used each set of questions to do cross analysis, and see if they made any significant difference on the degree of efficacy of reaching teaching objectives.

A one-way ANOVA was utilised to analyse whether or not age, working years, the industry to which a company belonged, job title and job responsibility made any significant difference on the degree of the efficacy of reaching the teaching objectives. After analysis, if the questions were statistically significant, Scheffé's method was used for multiple comparisons.

## RESULTS OF THE DATA ANALYSIS

The analysis results of the different personal attributes are listed in Table 1.

### Gender

Different gender versus every aspect of the seven scales of the *sandwich* method was found to be statistically significant. This shows that every aspect of the *topping* method was not statistically significant. Men were higher than women in the *topping* scale.

### Age

Different age versus *topping* was statistically significant, which shows that the age of the interviewees affected their attitudes towards whether the *topping* teaching method affected students' employment prospects after graduation. However, their attitude towards the *sandwich* teaching method was not affected by age.

### Industry Type

Interviewees from different types of industry regarding the *topping* teaching method was not found to be statistically significant, but this shows that the *sandwich* teaching method is.

Table 1: Analysis of the different personal attributes.

	Type	Group	Sample #	Mean	SD	F Value	P Value
Type of Industry	A	Service	121	1.451	0.209	5.731	0.004***
		Mfg	56	1.374	0.166		
		Finance	29	1.523	0.212		
	B	Service	121	1.727	0.176	0.177	0.838
		Mfg	56	1.710	0.150		
		Finance	29	1.720	0.221		
Age	A	Age 20-29	42	1.434	0.157	1.138	0.335
		Age 30-39	114	1.230	0.212		
		Age 40-49	38	1.489	0.212		
		Age 50-59	12	1.476	0.173		
	B	Age 20-29	42	1.774	0.313	3.810	0.011**
		Age 30-39	114	1.685	0.185		
		Age 40-49	38	1.761	0.186		
		Age 50-59	12	1.765	0.110		
Gender	A	Male	113	1.403	0.184	-2.924	0.004***
		Female	93	1.485	0.218		
	B	Male	113	1.708	0.148	-1.212	0.227
		Female	93	1.738	0.204		
Awareness	A	Aware	25	1.396	0.185	-1.515	0.251
		Not aware	181	1.446	0.206		
	B	Aware	25	1.807	0.189	2.646	0.009***
		Not aware	181	1.709	0.171		
Job Title	A	Boss	89	1.453	0.202	1.749	0.158
		Worker	71	1.442	0.216		
		Manager	42	1.395	0.181		
		CEO	4	1.611	0.132		
	B	Boss	89	1.730	0.147	1.080	0.395
		Worker	71	1.726	0.175		
		Manager	42	1.685	0.185		
		CEO	4	1.891	0.035		
Type of Business	A	Marketing	31	1.388	0.204	4.207	0.007***
		Admin	121	1.464	0.203		
		Mfg	31	1.351	0.157		
		Others	23	1.506	0.219		
	B	Marketing	31	1.608	0.154	2.178	0.092*
		Admin	121	1.744	0.156		
		Mfg	31	1.607	0.162		
		Others	23	1.727	0.250		

\*\*\*p<0.01; \*\*p<0.05; \*p<0.1

#### Awareness

The result shows that every variable on the scale of the *sandwich* teaching method was not statistically significant. It can also be seen that the mean of the attitudes of those interviewees, who were not aware of the *topping* teaching method to every variable on the scale of the *topping* method,

was higher than for those who had heard about it. This shows that those who were not aware of it were in the majority. In the analysis of every variable, no matter whether one was aware of it or not, the mean difference was not large. As such, it can be seen that industry agreed with the concrete practice of the *Last Mile*. Also, the industry perspective proves Chen and Lee's argument that the goals of *topping* and *sandwich* teaching methods are consistent, but that their meanings differ [20]. Their methods are different even though they have consistent goals.

#### Job Title

The attitudes of interviewees with different job titles towards *topping* and *sandwich* teaching methods were not statistically significant. Regarding the *topping* teaching method, the mean for managers was 1.685, which shows their higher expectations concerning graduate employment. However, for the *sandwich* teaching method, the mean was 1.395, which is the lowest. From this, it can be seen that among those with different working years, managers have higher expectations.

#### Business Type

The attitudes of interviewees from different business types to both the *topping* and *sandwich* teaching methods were statistically significant. Regarding the *topping* model, those interviewees responsible for different businesses had high expectations concerning graduate employment. In particular, the mean of interviewees from manufactory businesses was 1.670. The *topping* teaching method was the lowest, which shows that interviewees from manufacturing businesses had higher expectations.

#### INDUSTRY PERSPECTIVE

A correlation analysis of teaching methods and teaching objectives was undertaken using a paired sample t-test to compare differences between the *topping* and *sandwich* methods. Using the SPSS exchange function, the set of questions for interpersonal interaction in the *topping* and *sandwich* teaching methods were assessed by way of cross analysis.

#### Analysis of the Industry Perspective of the Lesson Design for the *Topping* and *Sandwich* Teaching Methods

Table 2 shows the means of these two samples to be 3.724 and 2.906, respectively. The paired-sample's t-test was statistically significant, which means that the lesson design of the *topping*

Table 2: Results of the paired sample t-test for the set of questions of teaching elements of *topping* and *sandwich* teaching methods.

Paired-Sample t-Test	Teaching Methods	Sample No.	Mean	SD	T value	P value
Lesson design	<i>Topping</i> teaching method	206	3.724	0.614	-11.092	0.000***
	<i>Sandwich</i> teaching method	206	2.906	0.772		
Type of practical training	<i>Topping</i> teaching method	206	3.224	0.504	-1.314	0.190
	<i>Sandwich</i> teaching method	206	3.155	0.502		
Time of practical training	<i>Topping</i> teaching method	206	3.388	0.472	-9.050	0.000***
	<i>Sandwich</i> teaching method	206	2.915	0.527		
Attitude to practical training	<i>Topping</i> teaching method	206	3.255	0.420	-10.677	0.000***
	<i>Sandwich</i> teaching method	206	2.760	0.436		
Interpersonal interaction	<i>Topping</i> teaching method	206	3.519	0.723	-7.135	0.000***
	<i>Sandwich</i> teaching method	206	3.034	0.650		
Consciousness of employment	<i>Topping</i> teaching method	206	3.309	0.516	-4.566	0.000***
	<i>Sandwich</i> teaching method	206	3.045	0.564		
Customer interaction	<i>Topping</i> teaching method	206	3.485	0.769	-5.404	0.000***
	<i>Sandwich</i> teaching method	206	3.101	0.786		

\*\*\*p<0.01; \*\*p<0.05; \*p<0.1

teaching method was more statistically significant than that for *sandwich* teaching (the correlation value being -0.518). Given how large the sample mean is, it can be seen that the mean of the *topping* lesson design was more statistically significant than that of the *sandwich* design. This shows that the lesson design of the *topping* teaching method can fulfil the teaching objectives more than the *sandwich* teaching method [29][30].

#### Analysis of the Practical Training Types for the *Topping* and *Sandwich* Teaching Methods

Table 2 shows the means of the two samples to be 3.224 and 3.155, respectively. The results of the t-test of this paired sample shows that the type of practical training for the *topping* and *sandwich* teaching methods were not statistically significant (the correlation value being -0.141). This result indicates that, after students finish their theory and practice courses at their colleges, industry agrees with *topping* method of practical training [31].

#### Analysis of the Time of Practical Training for the *Topping* and *Sandwich* Teaching Methods

Table 2 lists the means of these two samples to be 3.388 and 2.915, respectively. The results of this paired-sample t-test were statistically significant, which means that the *topping* method's of practical training versus the *sandwich* was statistically significant (the correlation value being -0.121). According to the sample means, the *topping* method's time of practical training was higher than that for the *sandwich* method, which means that, according to the industry perspective, the *topping* timing of practical training can fulfil the teaching objectives more than the *sandwich* method.

#### Analysis of the Attitudes to the Practical Training for the *Topping* and *Sandwich* Teaching Methods

From Table 2, it can be seen that the means of these two samples were 3.255 and 2.760, respectively. The result of this paired-sample t-test is statistically significant, which means that the attitudes to the practical training for the *topping* teaching method versus the *sandwich* is statistically significant (the correlation value being -0.205). The mean of the attitudes to practical training for the *topping* teaching method was 3.255 compared to the *sandwich* method's 2.760; a big difference. This shows that attitudes to practical training for the *topping* teaching method can fulfil the teaching objectives better.

#### Analysis of the Level of Interpersonal Interaction during the Practical Training for the *Topping* and *Sandwich* Methods

From Table 2, it can be seen that the means of these two samples are 3.519 and 3.034, respectively. The result of the

paired-sample t-test was not statistically significant, which means that the level of interpersonal interaction during the practical training for the *topping* teaching method versus that for the *sandwich* teaching method was statistically significant (the correlation value being -0.007). According to the higher mean value, the mean for interpersonal interaction during the practical training for the *topping* teaching method was found to be higher than that for the *sandwich* method. That is to say, from the perspective of industry, with regard to the level of interpersonal interaction during the practical training period can be best fulfilled by the *topping* teaching method.

#### Analysis of the Consciousness of Employment in the Practical Training for the *Topping* and *Sandwich* Teaching Methods

From Table 2, it can be seen that the means of these two samples are 3.309 and 3.045, respectively. The result of the paired-sample t-test was found to be statistically significant, which means that consciousness of employment for the *topping* teaching method versus the *sandwich* method was statistically significant (the correlation value being -0.175). The bigger mean in this case indicates that the mean of consciousness of employment for the *topping* teaching method was higher than that for the *sandwich* method. That is to say, from the perspective of industry, the *topping* teaching method can fulfil the teaching objectives better compared to the *sandwich* teaching method [8][9].

#### Analysis of the Level of Customer Interaction in the Practical Training for the *Topping* and *Sandwich* Teaching Methods

Table 2 lists the means of these two samples to be 3.485 and 3.101, respectively. The result of this paired-sample t-test is statistically significant, which means that the level of customer interaction for the *topping* teaching method compared to the *sandwich* method is statistically significant (the correlation value being 0.143). According to how high the mean is, the mean of the level of customer interaction for the *topping* teaching method was higher than that of the *sandwich* method. That is to say, from the perspective of industry, the *topping* teaching method can better fulfil the teaching objectives compared to the level of customer interaction for the *sandwich* teaching method.

#### Analysis of Each Variable for the *Topping* and *Sandwich* Teaching Methods

A paired-sample t-test was utilised in order to examine the sets of questions for the *topping* and *sandwich* teaching methods. The test results show that the P value reached statistical significance. By comparing the means of the *topping* and *sandwich* teaching methods, it was found that the former is higher than that for the latter (see Table 3).

Table 3: Results of the paired-sample t-test of the set of questions for the *topping* and *sandwich* teaching methods.

Paired-Sample t-Test	Teaching Methods	Sample No.	Mean	SD	T Value	P Value
Theory and practice	<i>Topping</i> teaching method	206	3.725	0.573	-10.859	0.000***
	<i>Sandwich</i> teaching method	206	2.986	0.690		
Increased job opportunities	<i>Topping</i> teaching method	206	3.330	0.411	-9.434	0.000***
	<i>Sandwich</i> teaching method	206	2.805	0.502		
Improved interpersonal relationships	<i>Topping</i> teaching method	206	3.483	0.509	-8.040	0.000***
	<i>Sandwich</i> teaching method	206	3.087	0.523		
Reduced teaching costs	<i>Topping</i> teaching method	206	3.193	0.450	-10.539	0.000***
	<i>Sandwich</i> teaching method	206	2.683	0.456		

\*\*\*p<0.01; \*\*p<0.05; \*p<0.1

## Test and Verification of Theory and Practice

The results for both the *topping* and *sandwich* teaching methods regarding the accomplishment of the theoretical and practical teaching objectives were statistically significant. Therefore, from the perspective of industry, the *topping* teaching method is better with regard to the realisation of the theoretical and practical teaching objectives.

## Test and Verification of Increased Job Opportunities

The results show that both the *topping* and *sandwich* teaching methods concerning achieving increased job opportunities were statistically significant. Therefore, from the industry perspective, the *topping* teaching method was considered better regarding the accomplishment of the teaching objectives for increased job opportunities.

## Test and Verification of Improved Interpersonal Relationships

After using a paired-sample t-test to examine the sets of questions of the *topping* and *sandwich* teaching methods, the test results show that the P value reached statistical significance. After comparing the means, the *topping* teaching method had a higher mean than the *sandwich* teaching method (see Table 3). This results indicates that the *topping* and *sandwich* teaching methods regarding improved interpersonal relationships were statistically significant. Therefore, from the perspective of industry, the *topping* teaching method was considered more suitable to fulfilling the needs of industry for improved interpersonal relationships.

## Test and Verification of Reduced Teaching Costs

After using a paired-sample t-test to examine the sets of questions of *topping* and *sandwich* teaching methods, the test results show that the P value was statistically significant. After comparing the means, it was found that the mean for the *topping* teaching method was higher than that for the *sandwich* teaching method (see Table 3). The results show that the *topping* and *sandwich* teaching methods concerning reduced teaching costs were statistically significant. Therefore, from the perspective of industry, the *topping* teaching method was considered more suitable to fulfilling industry needs for reduced teaching costs.

## Summary

On the whole, using industry perspectives to analyse the differences between the *sandwich* and *topping* teaching methods will help educational institutions to be more able to fulfil the needs of industry. It was found in this study that *topping* teaching method is more suitable for fulfilling the needs of industry with regard to achieving the four teaching objectives of theory and practice, increased job opportunities, improved interpersonal relationships and reduced teaching costs. This was obtained by comparing the means and the results of a paired-sample t-test.

## CONCLUSIONS

Regarding the four teaching objectives of the *topping* teaching method and the seven elements of the *topping* and *sandwich* teaching methods, the research results indicate that industry agrees with them and accepts them to a large degree.

Further analysis and comparison was carried out using an experimental method and it was found that the *topping* teaching method is more able to fulfil the goal of the *Last Mile*, as argued by Sayling Wen, namely, being *employed after graduation* and breaking the myth of *grouping according to competence* held by industry of graduates from colleges of technology and vocation.

The analytical result of age shows that every aspect of the *topping* scale is not statistically significant. Men received higher scores than women on every aspect of the scale. The aspect of different types of industry for the *topping* teaching method was not found to be statistically significant. This shows that vis-à-vis the *sandwich* teaching method, it is statistically significant.

The views of the interviewees with different job titles to the *topping* and *sandwich* teaching methods were found to not be statistically significant. The views of the interviewees who had different types of jobs to the *topping* and *sandwich* teaching methods were deemed to be statistically significant. The views of interviewees who were responsible for different jobs to the *topping* and *sandwich* teaching methods were also found to be statistically significant.

From the perspective of industry, the *topping* and *sandwich* teaching methods can significantly affect the accomplishment of the four teaching objectives, specifically:

- The combination of theory and practice;
- Increased job opportunities;
- Improved interpersonal relationships;
- Reduced teaching costs.

Regarding the ability to achieve the teaching objectives, the *topping* teaching method was found to fit industry needs better. From the perspective of industry, compared to the *sandwich* teaching method, the *topping* method was considered to reach the teaching objectives better. Regarding the degree of fulfilling the teaching objectives, the *topping* teaching method was perceived as being better than the *sandwich* method. Also, the *topping* teaching method was seen as being better than the *sandwich* method regarding the weakening of the myth of grouping according to competence held by industry of graduates from colleges of technology and vocation, and reaching the goal of *being employed before graduation*.

## RECOMMENDATIONS

Regarding the narrowing of the gap between theory and practice, and according to the research results, various recommendations are offered here. Firstly, the *topping* teaching method should be promoted. According to the results, the *topping* teaching method can offer students from colleges of technology and vocation a better chance of employment. However, only 12.1% of firms are aware of the *topping* teaching method. This rate tends to be low and even those firms that have already cooperated with colleges have rarely heard about it. Therefore, this research suggests that colleges of technology and vocation should promote the *topping* teaching method, openly discuss it and build up a common consensus at academic conferences.

From the experimental results, if students' performance during practical training is good, then the possibility of industry recruitment is higher. Therefore, students' learning motivation

and work ethics can be examined during practical training, which could be a reference for firms to decide if they want to employ them. After students finish their basic courses in theory and practice, they can then go to those companies that have contracts with colleges to conduct practical training. This shows that their academic and personality education is more complete and healthy, which helps students' interpersonal interaction and gains them more opportunities for future employment. Furthermore, the consciousness of employment relates to a person's working attitudes and performance during practical training. Since senior students would be graduating soon, their consciousness of employment would be higher than junior high students. Therefore, if students engage in practical training too early, their personality has not developed completely. Their work ethics may not be so good and this may adversely affect the level of cooperation between colleges and industry. Consequently, undertaking practical training just before graduation is more able to fulfil the needs of industry.

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