A study on the *topping* and *sandwich* teaching method efficacy towards the *last mile* application from the perspective of vocational and technical college graduates

Ching-Yaw Chen†, Yu-Je Lee‡, Kae-Shuan Kao‡ & Ying-Ting Ho†

Shu-Te University, Kaoshiung, Taiwan†
Takming University of Science and Technology, Taipei, Taiwan‡

ABSTRACT: This study aims to discuss the differences between the *topping-teaching method* and the *sandwich-teaching method* from the viewpoints of graduates of vocational and technical colleges in Taiwan. It attempts to determine whether students are capable of reaching the *last mile* application as proposed by Wen, meaning to enable newly graduated students to enter the workforce immediately after graduation. This study used in-depth interviews as its research method, and the outcomes in various factors including programme design, training plans, timing and attitude, understanding the workforce and interactions with customers, are presented and discussed. Since the practitioners of the topping-teaching method closely collaborate with industry, the maturity and understanding of the graduate workforce is enhanced. It shows solid and positive results in achieving the *last mile* application.

INTRODUCTION

Training programmes have been used in vocational colleges for years. Although the *sandwich-teaching method* has been widely adopted in current industry-academia collaboration models, it has its difficulties and limitations in practice. Problems like gaps between academy and industry in the fast-changing environment exist and intern students have been treated as a cheap labour force [1].

This study is one of the *topping-teaching method* research series, thus, the preliminary results of its concept and views from both academic and industrial settings have been revealed. Through both technical and vocational education systems, companies were sought that were willing to undertake such industry-academia collaboration plans. After deciding on the companies, a promotional event around a contract signing is held.

Later, teachers would select qualified students from volunteers to participate in this teaching method. The selection process is rigorous. First, students have to submit an application to their faculty departments and schools and the departments hold an interview for the company representatives to meet students. Then, the companies announced recruitment lists and the training programme then started.

This innovative teaching method has been highly valued in both academic and industrial institutions. However, studies from students' perspectives have only begun to be discussed more recently, because this method is comparatively new and relative data of students' working experiences have only been collected for a few years. Hence, this study attempts to *hurdle* the topping-teaching method with graduates' prospects [2][3].

Since the number of students is insufficient for questionnaire samples, this study has implemented the *in-depth interview* instead of quantitative data collection. It aimed to analyse and compare the performance of those graduates in the workforce previously trained by the topping-teaching and sandwich-teaching methods, respectively. It also intended to identify the plan that would best meet industry expectations and requirements, to achieve *last mile* application and targeting of students to enter the workforce right after graduation.

Therefore, the research purposes of this study were:

1. To analyse and compare correlations of teaching methods and purposes between topping-teaching and sandwich-teaching methods of technical and vocational graduates.
2. To compare how industries decide whether a fresh graduate is qualified for a job position from seven differential factors of topping and sandwich-teaching methods.

LITERATURE REVIEW

Discussion on the *Last Mile* Application

Shi mentioned that the last mile application was originally introduced by the telecom industry to refer to the final leg of delivering connectivity from a communications provider to a customer [4]. It was, then, applied in the academic sphere to mean the final year course of technical and vocational college students, which was designed to combine academic knowledge with industrial professional knowledge so that students would have the required skills to enter the workforce right after completing their courses.

Wen, who believed technical and vocational colleges should offer the last mile program in the final year of school, proposed the last mile application. However, the last mile programme is not a traditional industry-academia collaboration programme but is designed to meet industry requirements. Chen believed that except for the gap between school learning and workplace skills, the myth of university ranking is a contrastive last mile application.

The virtues of the last mile program as beneficial to corporations, schools and students can be seen from different perspectives, as shown in Table 1.

Table1: Benefits of the last mile programme.

Benefits of the last mile program	
Target	Benefits
Corporation	1. Can directly find qualified talents from education system with lower cost. 2. Is easier to define and select qualified talents. 3. Shortens training time and cost of new employees. 4. Breaks the myth of university ranking.
Schools	1. Establish more direct communication between school and corporations to assist in achieving teaching target. 2. Increases practical teaching resources (teachers, teaching materials and programmes) and directly connects to corporate incubation. 3. Improves employment opportunities and school reputation.

Discussion on the Sandwich-teaching Method

The sandwich-teaching method was first introduced in Scotland in 1880, which was the earliest industry-academia collaboration model. In 1903, this model was brought to the rest of Britain, and until 1995, it had been applied in most tertiary education in Britain. This model was further adopted in Europe and North America, and it was mainly developed in the United States. By 1906, the founder of USA industry-academia collaboration, H. Schneider, had successfully implemented this model at the University of Cincinnati.

In practice, the sandwich-teaching method is applied over two semesters; students can choose to study in school for one semester and to take training in corporations for the other semester. According to this model, students would be able to apply what they learnt in school to their training position in the corporation, as well as achieving the goal of on-the-job training. In reality, the closed interaction between academic learning and verification of learning through training is also referred to as the *rotation model* [5].

The three main parties of the sandwich-teaching method include students, schools and corporations. In addition, franchised associations play a role as the bridge among these three parties, whose interaction structure is shown in Figure 1.
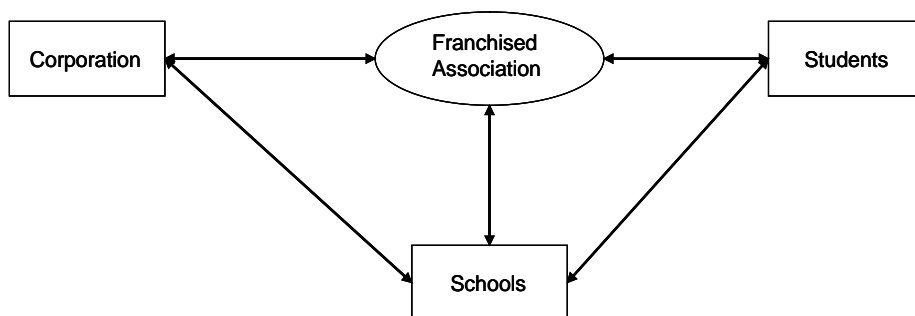

Figure 1: Structure of interaction of sandwich-learning model [6].

The formation or introduction of any system has its background and targets; the sandwich-teaching method is no exception. To summarise, according to the literature, there are four purposes for introducing the sandwich-teaching method: to combine theory and practice, to increase employment opportunities, to improve the social network of students and to decrease teaching cost [6-8].

Background and Definition of the Topping-teaching Method

The topping-teaching method was derived from sandwich-teaching. It was first introduced as the theme *Program and course design of topping-teaching method* in a course design seminar held by Shu-De University in April 2004. In an academic paper symposium hosted by National Yun Lin Univeristy of Science and Technology (NYUST) on 10 December 2004, topping-teaching formally became an academic usage [2].

From the perspective of corporations, this model decreases recruitment costs, as well as probation periods. It assists corporations in recruiting qualified staff with the latest knowledge and skills. On the other hand, as students are more mature in their final years/semesters of study, they tend to be more serious about their training.

Corporations are more willing to train final year students who will enter the workforce soon as this method would avoid the distinction of being criticised as hire a cheap labour force. Most importantly, students with outstanding performance in the topping-teaching method would be hired right after graduation, which would help to clarify the negative image of technical and vocational graduates and eliminate the harm that has derived from performance classifications of universities. Academia believed the topping-teaching method would solve all these problems.

The topping-teaching method aims to reach effective results of training to achieve the goal of allowing students to enter the workforce immediately following graduation. Discussion focused on skills learnt from technical and vocational schools is what is needed and this can reduce doubts about the ability of those students from the corporate perspectives.

Matching Sandwich-teaching and Last Mile

From the literature review, it was discovered that last mile could hurdle the gap between what students learn and how they apply it to the workplace, which would enable last mile to coordinate students' abilities with workplace requirements. Corporations tend to adapt university ranking to select new staff; therefore, this could be another meaning of last mile to vocational college graduates.

The sandwich-teaching method means that students acquire knowledge in schools for half the time, as well as being trained in corporations for the other half of the time. This teaching rotation method would allow teaching facilities to reach the most effective level.

Through the sandwich-teaching programme, schools provide technical support and knowledge that allow corporations to improve the working skills and competitiveness of their employees. Moreover, corporations could recruit qualified candidates, and employees could enhance their professional skills and working ethics, thus creating a win-win situation among corporations, students and schools; this would be a principal for maintaining sustainable collaboration.

Based on the background and development history of the sandwich-teaching programme, the new industry-academia collaboration model should consider the environment and requirement of workplaces to find the adequate breakthrough point. As development of automation and high technology proceeds, gaps between traditional techniques and modern techniques have increased, and self-independence and self-recognition has been acknowledged. Hence, the system and application of the sandwich-teaching method need adjustment to meet modern requirements.

A Match between Sandwich-teaching and Last Mile

In early discussions, it was stated that last mile could hurdle the gap between school learning and workplace skills to enable students to achieve the capability of meeting workplace requirements. The topping-teaching method simultaneously hurdles the last mile gap between learning and application and the last mile in the categorisation myth [8].

Arguments on How the Topping-teaching Method Hurdles the Last Mile Gap

Point 1: Hurdle the Gaps between Learning and Application

In the topping-teaching method, it was assumed that it was important to select the right corporations and include skills that the corporation believes are important to the workplace in course design. After the courses are completed, students go through candidate selection before working in corporations as interns. As a result, this model combines theoretical knowledge with practical skills that solve the last mile gap. Corporations have also supported this model as internal recruitment and HR systems have been improved.

Point 2: Myth of Capability Categorisation

Categorisation by capability has been discussed in industry. The survey conducted by CHEERS Magazine in 2004 validated university ranking as being viewed as equal to qualifications of candidates. In such a situation, if a topping-teaching plan is not included in final year courses, when students start seeking jobs after graduation, they will fall into the reality of capability myth. Academia shares the same view because the topping-teaching plan improved recruitment processes that assist in reducing the effect of capability myth.

Based on these two points, the topping-teaching plan is able to hurdle the gap of last mile to ideally achieve *being employed right after graduation.*

Challenges of Topping-teaching Method to Hurdle Last Mile

The CHEERS magazine survey conducted in 2004 showed nearly 65% of corporations rated graduating school highly, and only 7.9% agreed that technical and vocational school graduates have the capability to work. Furthermore, corporations think that there is a big gap between school learning and application in the workplace, so they have to train those graduates before reporting to work. In general, equivalent learning and application is the basic requirement to get a job, which corresponds to the last mile concept of Wen. Therefore, the topping-teaching method includes workplace skills in course materials, and when courses are completed, corporations will select candidates to participate in the training programme. Nevertheless, will this really solve the last mile gap?

Many technical and vocational colleges are collaborating with corporations to implement the topping-teaching method with positive results, but the last mile gap has not yet been solved. Although in real terms both academia and industry think this teaching programme is practical, feedback from students who have participated in this programme have not been reviewed. This study focuses on the viewpoints of technical and vocational college students by interviewing them to examine the results of the topping-teaching method.

Table 2: Comparison of sandwich-teaching and topping-teaching methods [9][10].

Teaching Method / Comparison		Sandwich-teaching	Topping-teaching
Proposed Time		First proposed in Scotland in 1980. Fu-Den Lee formally proposed the concept at National Kaohsiung Hospitality College in 1997.	First proposed in an Academic Seminar at Shu-Te University on 17 April 2004.
Purpose		Response to a request from academic institutions to enhance theoretical and practical skills.	Response to workplace skills and to break categorisation by capability myths.
Method		Learning while doing, seeking for opportunities to practice theoretical knowledge.	Including practical required skills in final year classes, and practicing theoretical knowledge in the workplace.
Methods and purpose of application	Theory in collaboration with Practice	The internship allows students to understand the workplace environment, so they can apply theoretical knowledge to practical work.	Designing courses that are needed for the real workplace and obtaining required knowledge and skills and being trained in workplaces.
	Increase employment opportunities for graduates	Corporations are unwilling to spend time to train students to whom they are uncertain about.	Internship before graduation is similar to workplace probation. Corporations are more willing to employ qualified candidates who are graduating soon.
	Improve social network of students	Sandwich teaching programme enables interaction with industries and customers to enhance student social networks and interactions.	Developing group working ability in order to enhance future teamwork capability.
	Decrease teaching cost	To utilise corporations' operating facilities to reduce the training facilities costs. However, this has been greatly affected due to industry migration.	Facing the fact of industry migration, attracting corporations' willingness to collaborate in training programmes as students are ready to be employed after the training programme. This would reduce relevant costs of schools, such as facilities and venues.

Comparison of Sandwich-teaching and Topping-teaching Methods

The purpose of topping-teaching and sandwich-teaching is the same, but from the results of literature reviews, a comparison of these two teaching programmes is shown in Table 2.

METHODOLOGY

Research Framework

Based on the previous discussion, seven differential factors were found between topping-teaching and sandwich-teaching methods. With the opinions about correlation of different efficacy and teaching target achievement of topping-teaching and sandwich-teaching of graduates (graduated for less than 2 years), the differences in effectiveness between those two teaching programmes were analysed. The research framework is shown in Figure 2.
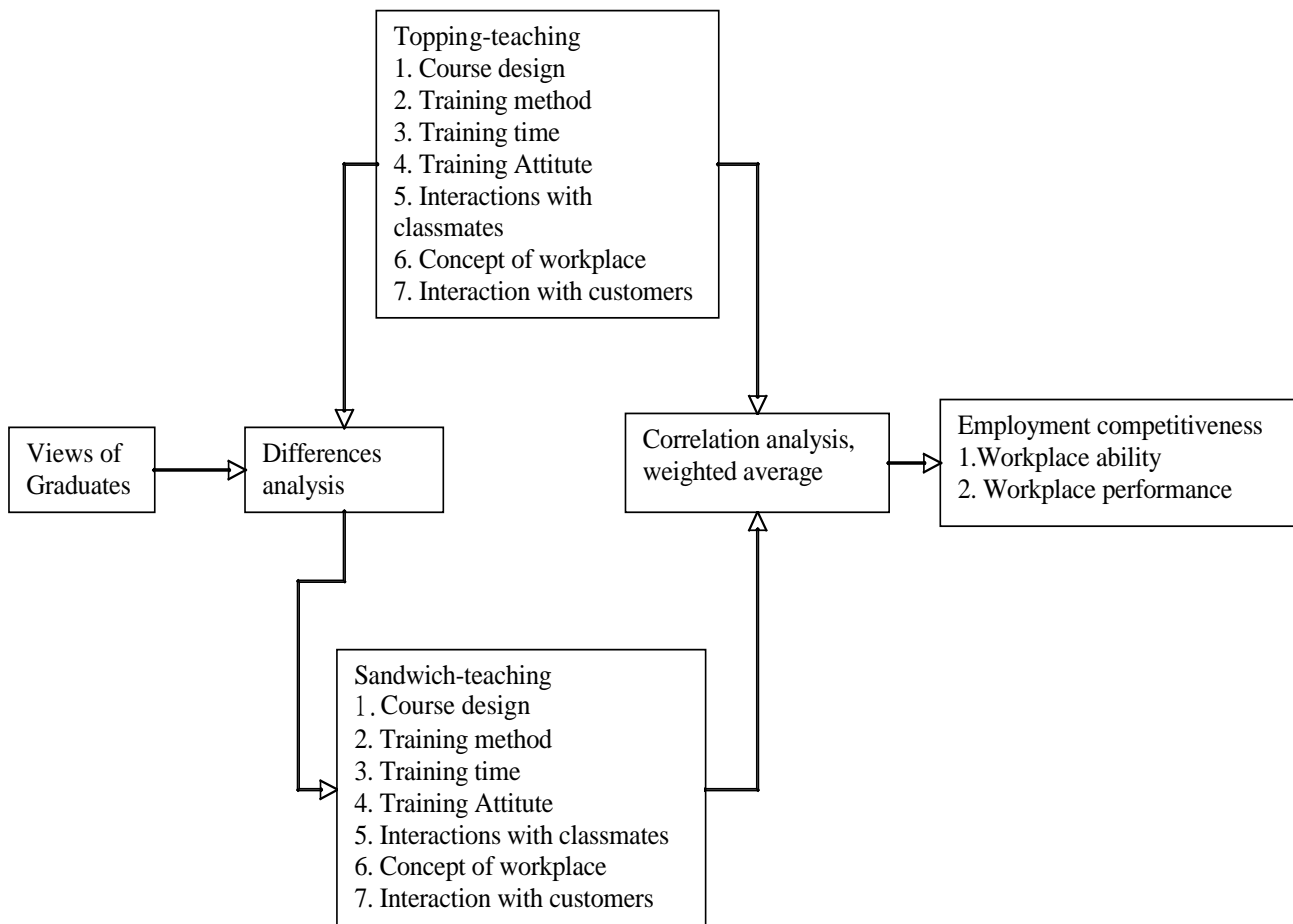

Figure 2: Conceptual research framework.

Research Method: In-depth Interviews

About 150 students undertook the topping-teaching method; hence, this study used in-depth interviews as the main research method. An in-depth interview, according to academic definition, is different from the simple interview; it aims to get the real content, concept, influences and effects, future development and solutions through a more intensive interviewing process. Generally, in-depth interviews take more time, but they provide information and data that are more detailed, which would be used as the basis for analysis. In-depth interviews are closer to what is really in the interviewees' minds that enables interviewers to obtain information that is more realistic [5].

Research Tools

Procedures of Conducting Interview Questions

The interview questions were divided into three parts, namely: (1) basic information; (2) seven differential factors that are designed to understand students' viewpoints and feedback about the sandwich-teaching method and the topping-teaching method; and (3) employment competitiveness: to understand competitiveness of students who were enrolled in courses utilising the sandwich-teaching method and the topping-teaching method.

Design Interview Questions

The questions were designed in consultation to the questionnaires conducted by Chen to understand perspectives of academia and various industries concerning topping-teaching, as well as issue of current situations and changes. Questions were designed to be open-ended questions based on the seven differential factors.

Research Targets

This research sampling randomly selected students who graduated from technical and vocational colleges less than (including) two years previously. The sample group was further divided into: (1) those who only undertook the topping-teaching method; (2) those who only undertook the sandwich-teaching method; and (3) those who undertook both the topping-teaching method and the sandwich-teaching method.

RESEARCH DATA ANALYSIS

Background of Research Data

Based on the previous discussion and the research sample, seven differential factors of the topping-teaching method and the sandwich-teaching method were determined. In addition, this study analysed the correlation of efficiencies and achievement to the ideal teaching target of these two teaching programmes.

Data Analysis

Interviews were conducted to understand opinions of graduates concerning both sandwich-teaching and topping-teaching programmes. These graduates participated in either or both programmes and were then working in different industries. The data were processed with seven analytical aspects, namely: course design, training method, duration of internship, learning attitude, interaction with colleagues/classmates, understanding of workplaces and interaction with customers. These were further analysed *vis-à-vis* teaching content, teaching differences and employment competitiveness.

Differences Analysis

Significant differences were found in students' opinions about those who participated in sandwich-teaching and topping-teaching methods. The analyses are shown in Tables 3 to 9.

Table 3: Comparison between course design of sandwich-teaching and that of topping-teaching.

Sandwich-teaching
(1) Schools offer diversified training opportunities for students.
(2) Schools do not offer special lectures for students who participate in training.
(3) Students take professional courses if schools offer them.
Topping-teaching
(1) Schools select corporations that most fulfilled students' future employment plans.
(2) Students' expressions about treasuring these training opportunities.
(3) Teachers offer lectures on work attitude and corporation ethics.
(4) Teachers try best to solve questions that students encounter, and invite successful industries and business people to share their experiences.

Table 4: Comparison between implementation methods of sandwich-teaching and that of topping-teaching.

Sandwich-teaching
(1) During internship, most students are unsure about future career plans and those corporations might not be the companies where students want to be employed.
(2) There are no recruiting procedures and most students can participate in the program.
(3) There are more lectures rather than actual job training during internship.
(4) As some students were unsure about future directions, companies did not actively keep those particular interns.
(5) Students did not interact with intern colleagues and supervisors after graduation.
Topping-teaching
(1) During internship, most students know about future career plans, and those corporations with training programmes are companies they want to work with.
(2) Candidates are selected via strict procedures, and students are serious about internship interviews.
(3) Students are directly involved in the work and learn what official procedures occur during an internship.

(4)	As students know about their future plans, companies tend to keep those interns with good performance after training programmes.
(5)	Students still keep in touch with their supervisors of training programmes.
(6)	The acceptance rates of those interns are higher than people who go through ordinary recruitment procedures. Some managers would offer interviews directly to those interns.
(7)	During the internship, students and corporations have established trust between each other.
(8)	Students expressed more positive comments than negative comments about staying in companies where students received their training programmes.

Table 5: Comparison between training duration of sandwich-teaching and that of topping-teaching.

Sandwich-teaching
(1) Training focuses on summer or winter vacations of year 2 or year 3 of university.
(2) The maturity of year 2 or year 3 students is still under-developed.
(3) Students are unsure about their future plans.
(4) Students are incapable of solving problems, dealing with pressure, are immature and have lower EQ during the internship.
(5) Year 2 and year 3 students are less confident as their professional knowledge is incomplete.
Topping-teaching
(1) Training programmes occur during year 4 (the final year) of university studies.
(2) Students are more mature as they are facing challenges of whether to continue studies or enter the workforce.
(3) Students are more certain about future plans.
(4) Students are more capable of dealing with pressures, solving problems and are more mature and have higher EQ.
(5) Students are more confident in their professional area as they have completed more studies in this field.

Table 6: Comparison between training duration of sandwich-teaching and that of topping-teaching.

Sandwich-teaching
(1) More passive learning, have a *do as requested* attitude.
(2) Watching of official employees rather than performing work items themselves.
(3) Students do not view the training programmes as a preparation for the workforce; they think the programme is like school studies.
(4) Students do not yet have professional certifications, and they lack confidence.
(5) As they have not completed their studies, they are still uncertain about professional knowledge; sometimes they do not know where to start.
(6) Students think they still have much time to decide on their employment; they tend to acquire training experience in the programmes.
(7) Students do not care much about their performance, as they might not want to work in the training companies since they still have much time before graduation.
Topping-teaching
(1) Demonstrate more initiative; students observe the work that official employees are doing.
(2) Actively help official employees in their work.
(3) Hoping managers and supervisors would notice their performance.
(4) Are acquiring professional certifications, and are more confident in professional areas.
(5) Are acquiring most professional knowledge and skills; and are willing to be trained to acquire skills and knowledge for the workplace.
(6) As students are going to graduate, the companies for training could be the industry they will work with; therefore, most students treasure this training opportunity.
(7) Most students hope to work in the training companies; therefore, they will try their best in the training programmes.

Table 7: Comparison between interactions with classmates of sandwich-teaching and that of topping-teaching.

Sandwich-teaching
(1) The official employees of the company treat students like little sisters/brothers, taking care of them.
(2) Intern students are relatively young; they are afraid of managers and unwilling to get closer to their managers.
(3) Students exchange professional information and help each other.
Topping-teaching
(1) Official employees of company help and care for students.
(2) Students take the initiative to learn and imitate successful employee working habits.

Sandwich-teaching
(3) Managers would request students to show their professional knowledge, which enables students to learn. There are positive competitive results among students.
(4) Students would discuss and help each other when they encounter problems in their internship.
(5) Students understand that the power of a team is larger than that of the individual; they work to be the best in the team.

Table 8: Comparison between workplace consciousness of sandwich-teaching and that of topping-teaching.

Sandwich-teaching
(1) Students didn't care much if their managers appreciated their abilities or not.
(2) Students wish to gain experiences during the internship.
(3) Students find their future direction through internship.
Topping-teaching
(1) Students want managers' appreciation for their working abilities.
(2) After training programs, students are more confident of dealing with their future jobs.
(3) Students could start working in the industries they want and learn about workplace culture earlier.
(4) Students wish to work for the company if they have performed well during internship.
(5) Students are positive about the internship

Table 9: Comparison between interactions with customers of sandwich-teaching and that of topping-teaching.

Sandwich-teaching
(1) Students are not mature enough so they feel nervous when dealing with customers.
(2) Managers are worried about leaving students to deal with customers alone, so students have limited interactions with customers.
(3) The company's training programmes deliver the concept that customers are the biggest asset of the company.
(4) Students have little awareness about customers being the biggest asset of the company.
Topping-teaching
(1) Students are more mature and they know more about how to interact with customers.
(2) Managers are more comfortable in leaving students to deal with customers alone.
(3) Students have more interactions with customers.
(4) The company keeps delivering the message of customers being the biggest asset of the company.
(5) Understanding the importance of service quality via working in frontline customer services.
(6) Realising the concept that *customers are the biggest asset of the company* by learning from official employees, they start to look for potential customers and maintaining good relationships with them.

Interpretation of Data

The data were processed according to seven analytical aspects, which are course design, training method, duration of internship, learning attitude, interaction with colleagues/classmates, understanding of workplaces and interaction with customers. Those were further analysed with teaching content, teaching differences and employment competitiveness, and the results show the following:

In course design: topping-teaching programmes are tailor-made for the companies, and teachers are requested to be involved in the internship programs. Students understand clearly about working attitude and corporation culture of workplaces, which enhances their competitiveness. Thus, the topping-teaching method is better than the sandwich-teaching method against this criterion.

In training methods: as students are clearer about their future direction and the company is strict in selecting interns, the company takes internship as an initial period of probation, which enables students to be more serious about this internship. Therefore, the training methods of topping-teaching are better than that of sandwich-teaching.

Topping-teaching method commences in the final year of university studies: students are more mature, possess higher EQ, and are more capable of dealing with pressures. In addition, as the training programme commences in the final year, it increases the competitiveness of students; hence, the training time of the topping-teaching method is more appropriate than that of the sandwich-teaching method.

In learning attitude: students start to show their professional field and do their best; therefore, their initiatives increase their competitiveness. Students of the topping-teaching method are more aggressive and positive, thus, students' attitude are better with the topping-teaching method than that of the sandwich-teaching method.

In interactions with colleagues and classmates: students learn about working habits of successful managers, and they know how to leverage the power of teamwork to reach highest efficacy. Positive results of inter-student competitions enhance their competitiveness assertiveness; hence, the topping-teaching method has better results in this criterion than that of the sandwich-teaching method.

In the understanding of the workplace: students want managers' approval for their performance. They are confident about their working abilities that clearly understand workplace ethics and corporate culture. Strong understanding of the workplace has strengthened their competitiveness; thus, the topping-teaching method performs better in this criterion.

In interaction with customers: the topping-teaching method students have more chances to contact customers; thus, they have better communication skills. They understand that customers are the most important assets of the company, and to have good communications skills and interactions with customers would also increase their competitiveness. Therefore, the topping-teaching method performs better in this criterion.

CONCLUSION

The results show the general acceptance by students on their internship according to seven different teaching styles of the topping-teaching method and the sandwich-teaching method respectively. In addition, with real case analysis and comparisons, it was attempted to determine whether topping-teaching could achieve the target of last mile application, which means students are successful in job placement right after graduation. It was also aimed to break the myth of capability categorisation of ordinary university students and that of vocational and technical college students.

For both the topping-teaching method and the sandwich-teaching method:

- *Students' views on course design*: the interviews with students confirm that the course design of the topping-teaching method would facilitate students in adjusting to the workplace culture and meet corporate requirements.
- *Students' views on methods of training*: the interviews with students confirm that under the topping-teaching method, students are clear about their future direction, and they take these training programmes seriously, treasuring these opportunities, and at the same time, meeting corporate requirements.
- *Students' views on time of training*: the interviews confirm that the level of maturity is higher in students under the topping-teaching method. When students encounter difficulties, they deal with these in a more positive way and meet corporate requirements at the same time.
- *Students' views on learning attitude*: the interviews confirm that students are relatively more aggressive/assertive under the topping-teaching method, which allows students to be more confident and professional, and at the same time, meet corporate requirements.
- *Students' views on interaction with colleagues/classmates*: the interviews confirm students are clearer about teamwork and power under the topping-teaching method; and, at the same time, they can meet corporate requirements.
- *Students' views on understanding of the workplaces*: the interviews confirm students are more confident about their profession under the topping-teaching method, and they are no longer worried about graduating from vocational and technical schools. At the same time, they meet corporate requirements.
- *Students' views on interactions with customers*: the interviews confirm students understand clearly that customers are the most important asset of companies, and they learn to maintain good relationships with customers under the topping-teaching method. At the same time, they meet corporate requirements.

In summary, students think that the topping-teaching method can better realise the target of entering the workplace immediately after graduation.

REFERENCES

1. Prince, M.J., Felder, R.M. and Brent, R., Does faculty research improve undergraduate teaching? An analysis of existing and potential synergies. *J. of Engng. Educ.*, 283-294 (2007).
2. Brewer, M., Sandwich courses. *J. of Cooperative Educ.*, 26, **2**, 14-22 (1990).
3. Wen, C-R., Chen, H-P. and Ma, F-H., Industry-academia collaboration model – a brief discussion on sandwich-teaching method. *J. of Communication, Network and Socialization,* Nan-Hua University, 39 (2004).
4. Shi, Z-Y., Views of Zi-Yi Shi, the last mile: from school to corporations. *CEO Reviews,* 10, **12** (2003).
5. Yang, Y-R. and Li, X-M., Implementation and perspective of sandwich-teaching program of vocational and technical education. *Business Vocational Educ.*, 76, 13-17 (2000).
6. Hsu, C-S., Implementation strategies of sandwich-teaching programs on tertiary studies. *Technical and Vocational Educ. Bi-monthly Magazine*, 58, 46-51 (2000).
7. Wu, C-F., Yeh, C-Z. and Li, R-Y., A study on sandwich-teaching method of vocational and technical colleges from case of Logistic Management Department. *Paper of Knowledge Based Economy and Educ. Development Inter. Academic Seminar*, 199-212 (2001).
8. Li, F-D., Implementation results of sandwich teaching methods at technical and vocational colleges. *J. of Kaohsiung Hospitality College*, 1, 3 (1998).

9. Wu, C-F., A study on sandwich-teaching method of vocational and technical colleges, a case of Logistic Management Faculty. Postgraduate thesis of Dept of Vocational and Technical Education, National Taipei University of Technology (2001).
10. From School to Industry, the last mile applications (2005), 9 September 2009, web.ydu.edu.tw/~edward_ku/ lastmile.htm