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Effects of Pedagogy and Internship Schemes on Students' Employability - Using the Macro Environment as a Control Variable

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ABSTRACT: *Following the advancement of technology in recent years, teaching methods have also changed, and methods such as flipped teaching, MOOCs and distance learning have emerged as a result. Moreover, in order to enable students to better apply the theories acquired in school to practice, and in order to "integrate learning with application", the school has introduced two internship schemes, which are: (1) Sandwich Internship Program; (2) Topping Internship Program.*

The purpose of this study is to verify the effect of pedagogy and internship schemes on students' employability, using the macro environment as the control variable, which is, assuming that the macro environment is not taken into account in the research model of this study, despite its significant effect on students' employability. In this study, senior students of a university of science and technology in Taiwan and instructors of these senior classes are the research population. The purposive sampling method is adopted to sample the population. Structural Equation Modelling, SEM, is used to construct the models and to verify the goodness-of-fit of the models. The results show that: (1) pedagogy has effects on the employability of senior students of a university of science and technology in Taiwan, but the effects are not significant; (2) internship schemes have positive and significant effects on the employability of senior students, with the Topping internship scheme being comparatively better; (3) pedagogy and internship schemes have positive and significant interaction effects on the employability of senior students. The results of this study can be provided to decision makers of relevant departments in domestic tertiary institutions and employers for reference, as well as for use in academic research, and not for other purposes.

KEY WORD*:* ***Pedagogy, Topping Internship, Sandwich Internship, Student Employability***

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I. INTRODUCTION

Due to the popularity of the Internet, the proportion of young people using the Internet has increased dramatically, and students' self-learning abilities are becoming more important. Digital learning and Internet usage have become an important channel for acquiring knowledge, which makes technology-assisted competitiveness an important direction for human resource training.

Teaching is an interactive process between teachers and students. It can be subjects-oriented or students-oriented. The former emphasizes the teaching of academic disciplines; whilst the latter focuses on the domain knowledge relevant to the employability of students (Van Driel, Bulte, & Verloop, 2007).

Griliches & Jorgendon (1966) argued that the causes of economic growth that could not be explained in the past are attributable to residual factors; however, the residual factors should now be revisited. One such residual factor is in the form of human capital, and the quality of this human capital is associated with the results of education. Therefore, education may enhance the value of human capital, which in turn creates economic growth.

As such, some scholars suggest that developing and maintaining employability is an important defining component that can help retain key employees in times of talent scarcity (Bieling, Stock & Dorozalla, 2015). Companies would like to retain employees who are valuable to the company, but whether the employees are willing to be recruited, or not, depends on whether the human resource management solutions and measures that the company puts in place can meet the demands of the employees.

There is a certain degree of gap between school education and actual corporate recruitment requirements, and the only way to make the best use of available talent is to narrow the gap between the two. Therefore, school education should have a broad understanding of the societal needs. The role of the teacher is to guide the students and inspire their latent abilities and creativity, while at the same time cultivating positive

values and good moral character. When the country's basic academic achievements are generally elevated, it becomes more important to optimize national competence and human resource competence, in order to help improve industrial productivity and encourage positive economic growth (Shi, 2014; Wu, 2021).

The government, schools and enterprises all greatly value employability. Relevant organizations are conducting research on employability in the hope that this research can serve as a basis for government policy formulation or school curriculum design, so as to address the issues where the government and schools are currently unable to fully understand market demand. The schools may also collaborate with enterprises to provide students with internships, so that they can make up for the lack of practical education in the schools. Nevertheless, the gap between industry requirements and academia curriculum is still an issue that must be discussed these days when exploring employability. As the industrial environment keeps changing, enterprises are demanding talent that can not only work in the current job market, but that is also adaptable to future changes in the environment. Therefore, in order for students to be competitive, schools and enterprises should work together to determine the employability traits and skills that students must possess.

In following the advancement of technology, teaching methods have also changed, and methods such as flipped teaching, MOOCs and distance learning have emerged as a result. Moreover, in order to enable students to apply the theories acquired in school to practice, and in order to "integrate learning with application", school have introduced two internship schemes, which are: (1) Sandwich Internship Program; (2) Topping Internship Program.

In short, the advancement of science and technology and the changes of industrial structures have caused a gap between the talent cultivated by the technical and vocational education institutions and the requirements of corporations; what students are learning does not apply to actual job requirements. How to make students aware of the current employment directions and prepare them for the future work environments and work contents, so that they can successfully enter society after graduation, has become an urgent task for technical and vocational schools to overcome. However, do the students' job skills and work attitudes actually have an impact on the satisfaction of internship employers? This is one of the major research topics worth studying.

Therefore, this study aims to verify the impact of students' job skills and work attitudes on employers' satisfaction, so as to validate the effect of pedagogy and internship schemes on students' employability. The macro environment is used as the control variable in this study, which is, assuming that the macro environment is not taken into account in the research model of this study, despite its significant effect on students' employability. In this study, senior students of a university of science and technology in Taiwan and instructors of these senior classes are the research population. The purposive sampling method is adopted to sample the population. The Structural Equation Modelling, SEM, is used to construct the models and to verify the goodness-of-fit of the models. The specific objectives of this study are briefly described as follows: (1) Whether or not pedagogy has positive and significant effects on the employability of senior students of a university of science and technology in Taiwan; (2) Whether or not internship schemes have positive and significant effects on the employability of senior students; and (3) Whether nor not pedagogy and internship schemes have positive and significant interaction effects on the employability of senior students.

II. LITERATURE REVIEW

2.1 The Conceptual Definition of Pedagogy

The conceptual definition of pedagogy in this study is "the instructional methods that teachers use in the classroom and the demands they place on students, which may include: traditional teaching, flipped teaching, MOOCs, and distance learning" The above definition is derived from referencing the following literature.

Lin & Nien (2000) argued that traditional education is general education, with no need to factor into individual differences of learners. Teaching comes first, followed by learning. Curricula are usually determined by teachers and students are less able to learn independently. Due to a lack of comprehensive and appropriate teaching materials and media, traditional teaching is often delivered with didactic instruction in the classroom. It is the most conventional, representative, and widely accepted teaching method. This method is done with teachers giving systematic and organized verbal instruction on a topic (Tsai, 2009).

Liu (2001) proposed that distance learning systems can be divided into synchronous and non-synchronous. Synchronous method refers to where teachers and students can be at different locations, but on the same time, when the teaching is conducted, while asynchronous method refers to that where the course content is placed on the Internet and students can choose to study at any time.

Liao (2017) pointed out that the flipped teaching model is a student-centred instructional design, with the intention of stimulating students' independent learning, which differs from the "teacher speaks, students listen" teaching model. There are a variety of teaching activities in the classroom, and through raising questions, students can develop critical thinking skills and higher-level abilities to internalize the information they learned.

Teachers make good use of face-to-face classroom time with students, thus building a good interactive relationship with them. The designs of flipped teaching activities can be divided into three stages: (1) before, (2) during and (3) after the class. The key to a successful implementation of flipped teaching is that both the teachers and the students perform their defined, but different roles in the classroom activities.

Wang (2018) pointed out that flipped teaching must have the following course design elements and procedures: teacher designs and provides students with pre-class learning materials, students' self-study before the class, group discussions in the classroom, and teacher-student exchanges and peer feedback. Such a method of stepped process is the essence of flipped teaching. Wang also proposed that flipped teaching is composed of four aspects: "independent learning, exchange and feedback, technology assistance, diversified evaluation". In each of the aspects, a higher score implies a higher degree of flipped teaching; a lower score implies a lesser degree of flipped teaching.

The system of MOOCs consists of five elements: (1) Instructors: Simplify the learning process by producing appropriate instruction materials to initiate communication between learners and manage evaluations of expected learning outcomes. (2) Learners: Anyone who wants to learn about a certain subject is authorized to register. Learners can pursue formal degrees or credits provided by some courses, or only access specific content. (3) Topics: Topics brought in by learners, teachers, textbooks and situations are introduced through the entire system, and may be limited in scope but are broad enough to cover various fields. (4) Material: It exists on various websites in various forms and is accessible through various technical solutions. And (5) Context: It refers to various elements that make up a course environment. Each course can be constructed by combining online social networks, common information sources, and various types of information delivery methods, communication systems, expected learning outcomes and groups (Tabaa & Medouri, 2013; Chen, 2016).

2.2 The Definition of Students' Employability

The definition of student employability in this study is "the employability of recent graduates in the workplace and is measured in terms of the percentage of students who are employed". The above definition is derived from referencing the following literature.

Pool & Sewell (2007) advocated that employability involves a set of skills, knowledge, career understanding and personal attitudes that enable individuals to make better choices and ensure that they find satisfying work and are able to succeed.

Rothwell & Arnold (2007) suggested that employability is related to employment within the current organization as well as to external employability for employment outside the organization. People with high employability are less vulnerable to threats from external circumstances, feel less stress, and perform better at work (Berntson & Marklund, 2007). Therefore, Rothwell & Arnold (2007) classified employability in the labor market into personal attributes and occupational attributes and categorize the labor market into an "internal labor market" and an "external labor market". The scope of the internal labor market includes all the labor force within the organization of current employment, while the scope of the external labor market is beyond the organization of current employment and includes all the labor force in both internal and external organizations.

The National Youth Commission of the Executive Yuan (2006) categorized the employability of college graduates into "core employability" and "professional and technical skills". Wherein, the core employability can be further divided into the following three categories: (1) job-friendly work attitude and cooperative ability: good work attitude, stability and stress resistance, teamwork ability, and awareness of and compliance with professional ethics and morals; (2) career planning and management and proactive learning: willingness to learn and malleability, career planning ability, understanding of industry environment and development, job search and self-marketing ability, innovation ability, leadership ability; and (3) professional expertise and the ability to apply it in the workplace: communication skills, problem-solving skills, professional expertise and skills, basic computer skills, foreign language skills, and having professional certification.

2.3 Macro Environmental Factors

The definition of "macro environmental factors" in this study is "forces that have a relatively large and far-reaching impact and are difficult to control, such as political, economic, technological, cultural, social and others factors." The above definition is derived from referencing the following literature.

Pearce & Robinson (2000) classified the external environment into (1) macro environment: economic, social, political, technological, and environmental ecology; (2) industrial environment: barriers to entry, supplier bargaining power, substitutes, and existing competitors; and (3) operational environment: competitors, customers, labor, suppliers, and lenders. With the uncertainty of the environment, the awareness of the environmental level expands to affect the organizational strategy, and the environmental level also changes from perceptual relationship, task relationship to organizational relationship, making the environmental impact inseparable from the business operation and becoming more important, particularly in the formulation and selection of business strategy.

Mimi (2011) argued that the macro environment refers to factors that have a relatively large and far-reaching impact, are more difficult to control, and may indirectly affect the micro environment; therefore, the "macro environment" is also called the "indirect environment". The "macro environment" changes slowly and covers a large number of environmental variables but has a relatively broad impact. Typically, the "macro environment" affects not just a single industry, but "industries in general", that is, many industries are affected by it. These are environments that affect the businesses that operate and engage in marketing activities on a national and societal level, including: economics, politics, policy, law, population, social culture, technology, the Internet, international situations and other environments.

Huang (2011) pointed out that the macro environment: is a force that has a relatively large and far-reaching impact and is difficult to control, such as political, economic, technological, cultural, social and other forces. These forces will affect every manufacturer and industry, as well as the micro environment. The following items illustrate the relationship between these macro environmental factors and marketing:

(1) Political and legal environment: The philosophy of political parties, as well as the policies, decrees, and administrative measures of governments at all levels, affect the operation and marketing of enterprises.

(2) Economic environment: (a) the direction of economic policy: The overall economic policy of a country or the policy for a particular industry can be roughly divided into two directions: regulation and liberalization. (b) Economic climate and inflation: There are four stages of economic climate, also known as the economic cycle or business cycle: depression, recovery, prosperity and recession. (c) Household income: An increase in household income may lead to a change in consumption patterns. (d) International economics and exchange rates: The international economic dynamics can easily impact Taiwan's domestic and international markets.

(3) Technology environment: (a) science and technology: the impact of technology on the landscape and structure of the market is that manufacturers have more opportunities to develop new products. (b) Internet: The development of information technology in recent decades has been one of the most important revolutions in the history of mankind, and it has and will continue to change the way we live and work.

(4) Cultural environment: (a) Culture and subculture: Culture is a synthesis of lifestyles, customs, values, and behavioral characteristics. Every society has a sub-culture, i. e. a culture of a specific group. (b) Leisure style: Leisure style is an important part of the living culture. (c) Perceptions of nature and environmental protection: Consumers' perceptions of nature and environmental protection have a significant impact on their purchasing and consumption behaviors and should be taken seriously by marketers.

(5) Social environment: (a) Population growth and age structure: The population growth rate of a region affects the scale and future viability of the market, while the age group affects the demand for clothing, food, housing, transportation, entertainment, and medical care. (b) Geographical distribution of the population: The geographical distribution of the population indicates the trend of human migration, and is therefore closely related to the target market selection, marketing channels, and site selection.

2.4 The Relationship of Pairwise Dimensions

To date, this study has not found any literature discussing "pedagogy on student employability", "internship schemes and student employability", or "pedagogy, internship schemes, and student employability". For the sake of simplifying the model and making it more logical, this study excludes the control variable - macro environment - from the discussion, and proposes the following hypotheses.

Hypothesis 1 (H_1): Pedagogy has positive and significant effects on the employability of senior students in a university of science and technology in Taiwan.

Hypothesis 2 (H_2): Internship schemes have positive and significant effects on the employability of senior students.

Hypothesis 3 (H_3): Pedagogy and internship schemes have interaction effects on the employability of senior students.

III. RESEARCH FRAMEWORK

The research framework of this study is based on the above research motivation, purpose, literature review and hypothesis, as shown in Figure 1

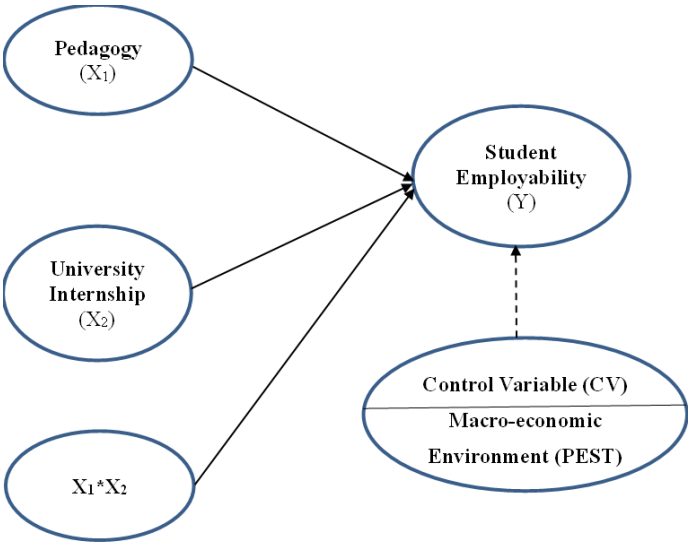

Figure 1 Research Framework

3.1 Sampling method

The Purposive Sampling Method was used in this study to conduct a sample survey on the population. Senior students of a university of science and technology in Taiwan and instructors of these senior classes are the research population of this study. Twenty expert questionnaires were distributed as a pilot-test for the study. The post-test was administered after installing the improvement suggestions made by the academic experts. A total of 450 questionnaires (including 15 for instructors and 435 for students) were officially distributed, and the valid sample was 310 (including 14 for instructors and 296 for students), with a valid sample recovery rate of 68.89%.

3.2 Questionnaire Design

The questionnaire of this study is designed according to the main dimensions of the research topic. Although the questionnaire is designed according to "Itemized Test", the measurement scale is a 7-point Likert Scale. The answers were measured with 7 denoting Strongly Agree and 1 denoting Strongly Disagree. A higher score represents a greater level of agreement, and vice versa.

3.3 Questionnaire Data and Measurement System

In order to verify the research framework proposed by this study, a linear Structural Equation Model (SEM) is used to perform Confirmatory Factor Analysis (CFA) on the research model framework. In addition to designing the questionnaire according to the three latent variables (Pedagogy, Internship Schemes and Student Employability), this study performs measurement with AMOS software. The measurement results are compiled in Figure 2.

IV. RESULTS AND DISCUSSION

4.1 Linear structure model analysis

Confirmatory Factor Analysis (CFA) is a method of analysis in contrast to Exploratory Factor Analysis (EFA). In this study, senior students of a university of science and technology in Taiwan and instructors of these senior classes are the research population. The purposive sampling method is adopted to sample the population. Considering the representativeness issue of the students and instructors' sample, a statistical difference between students and teachers was examined to determine if there was significant difference between them. Therefore, on the assumption that only students are considered and that there is no difference between samples of teachers and students, the Structural Equation Modeling, (SEM) is used to verify whether the goodness-of-fit is established between the overall model and its structural model and measurement model.

4.2 Analyzing fit of Structure Model

4.2.1 Path analysis results of structure model

After the group model of this study has passed the goodness-of-fit test, the parameter Estimates, Standard Errors (S.E.) and Critical Ratio (C.R.) among latent variables were calculated (as shown in Table 1).

Table 1 Path analysis results of structure model

Path Coefficients between Implicit Variables			Estimate	S.E.	C.R.	P	Label
Pedagogy (X_1)	→	Student Employability (Y)	.46	.10	4.61	**	H_1
Internship Schemes (X_2)	→	Student Employability (Y)	.52	.12	4.33	**	H_2
$X_1 * X_2$	→	Student Employability (Y)	.63	.23	2.74	**	H_3

Note: * indicates P<0.05; ** indicates P<0.01; *** indicates P<0.001

4.2.2 Coefficient of Determination

The explaining level of each implicit independent variable to each implicit dependent variable is the R^2 value (Squared Multiple Correlation, SMC). Therefore, the R^2 value shown in Table 2 indicates that the implicit independent variable has adequate explaining ability on the implicit dependent variable respectively.

Table 2 Path Coefficient of Determination

Coefficients of Determination	R^2
Pedagogy (X_1)→Student Employability (Y)	.73
Internship Schemes (X_2)→Student Employability (Y)	.82
$X_1 * X_2 \rightarrow Y$	.76

4.3 The indices of fit of the overall model

The purpose of adopting SEM in the modeling phase of this study is to explore how unobservable variables are interconnected within the structural model, to determine if the measurement model has measurement reliability, and also to measure this study's overall goodness-of-fit effect using such indices as χ^2, d.f., GFI, AGFI, NFI, CFI, RMR and RMSEA. In most cases, it is required that χ^2/d.f. <5, 1>GFI>0.9, 1>NFI>0.9, 1>CFI>0.9, RMR<0.05 and RMSEA<0.05 (Bagozzi & Yi, 1988). The goodness-of-fit of the overall group model proved satisfactory because χ^2/d.f. <5 and GFI, AGFI and NFI all exceed 0.90, with the RMR smaller than 0.05 (see Table 3).

Table 3 The Fitting Evaluation Table of the Overall Group Model

Determination index	χ^2	DF	GFI	NFI	AGFI	CFI	RMR	RMSEA
Fit value	12.432	5	0.914	0.922	0.936	0.902	0.011	0.024

4.4 Standardized results of SEM analysis

The computerized un-standardized results of the overall framework are shown in Figure 2.

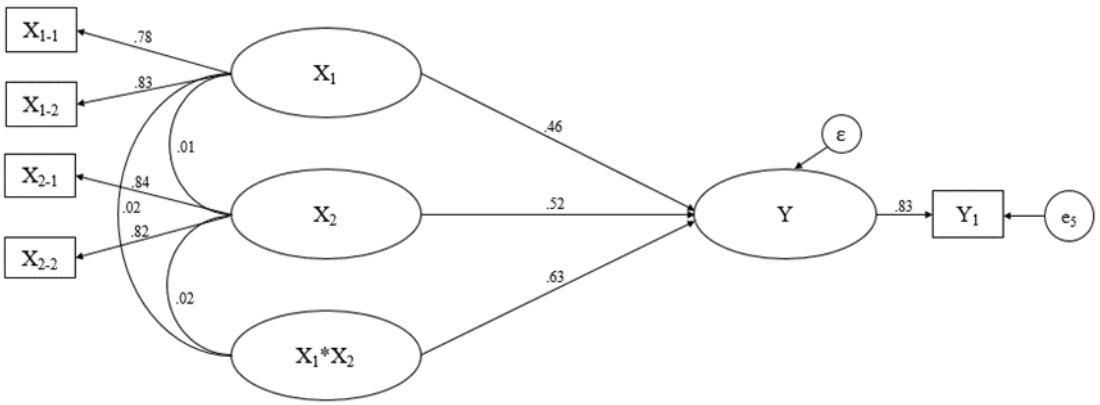

Figure 2 Un-standardized summarizing-result of SEM analysis

V. CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

The following conclusions are obtained from the above mentioned results and analysis:

1. In terms of validating Structural Equation Modelling (SEM), the structures of the Measurement Model, Structure Model, and overall group model of the SEM in this study have goodness-of-fit, showing good fitting effects (Table 3).
2. In terms of practical validation: Senior students of a university of science and technology in Taiwan and instructors of these senior classes are the research population

(1) Pedagogy has effects on the employability of senior students of a university of science and technology in Taiwan, but the effects are not significant; (2) internship schemes have positive and significant effects on the employability of senior students, with the Topping internship scheme being comparatively better; (3) pedagogy and internship schemes have positive and significant interaction effects on the employability of senior students.

(i) Pedagogy has effects on the employability of senior students of a university of science and technology in Taiwan, but the effects are not significant;

(ii) Internship schemes have positive and significant effects on the employability of senior students, with Topping internship scheme being comparatively better;

(iii) Pedagogy and internship schemes have positive and significant interaction effects on the employability of senior students.

5.2 Suggestions

One notable aspect of this study is that there is an "interactive" positive and significant effect of both pedagogy and internship schemes on the employability of college seniors. Therefore, it is recommended that teachers should use appropriate teaching methods to ensure that students have the professional competence required for employment and thus increase graduates' chances of being hired by desirable companies. Prior to starting an internship, students must have good working skills, including professional expertise and job skills, communication and presentation skills, a continuous learning aptitude, teamwork attitude, problem solving ability, innovation and development ability, and applicable IT ability. In addition, during the internship period, students must demonstrate a good work attitude, including a proactive and dedicated work ethic, stress resistance and emotion management, responsibility and discipline, interpersonal interaction, workplace ethics and moral conduct, cooperation and stability, and self-management.

In addition, when implementing the Topping Program, schools should incorporate the necessary competencies required by the representative companies in a particular industry into the curriculum, and then students who have acquired these competencies should be given priority to become interns or employees of these companies. Therefore, it is recommended that schools adopt Topping internship scheme so that students can "graduate with employment" and fulfill their dream of achieving the "last mile".

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