The Relationship between Teacher Quality and Teaching Effectiveness Perceived by Students from Industrial Vocational High Schools

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ABSTRACT

This research explores the relationship between teacher quality and teaching effectiveness perceived by students from Industrial Vocational High Schools. The conclusions are: (1) The present conditions of teacher quality and teaching effectiveness perceived by students are positive. (2) With different student "Grade," "Teacher Gender," "School Type" and "School Category," teacher quality perceived by students is significantly different. (3) With different student "Gender" and "School Type," teaching effectiveness is significantly different. (4) Teacher quality and teaching effectiveness are positively related, meaning the prediction power of teaching effectiveness, with teacher quality as the predictor, is significant.

Key words: industrial vocational high school, teacher quality, teaching effectiveness.

1. INTRODUCTION

Education scholars have pointed out that education quality is the reflection of education essence. There would be no good education without good teacher quality, for teaching effectiveness is the core mission of schools (Wang & Fwu, 2007). Students are the subjects of teaching activities, but the key factor of teaching effects is teacher because education quality is influenced by teaching effect (Andrew & Schwab, 1995; Bents, M. & Bents, R., 1990). However, it is found through documentary analysis that there are not many related discussions. If teacher quality's influence on teaching effectiveness can be further understood, it would be more assured that teachers' teaching performance and students' learning outcome will be improved.

The most important component of teaching activity is students. However, the key to teaching effectiveness is teachers. It is necessary to probe into teacher quality to help teachers ascertain their shortcomings so that they can not only improve themselves but also increase their teaching effectiveness. Secondly, teachers with good effectiveness usually value teaching performance, maintain teaching quality, pursue best teaching effectiveness and improve students' learning effectiveness. Therefore, the current status of teachers' teaching effectiveness should be learned and the influences of the variables of different student backgrounds and school environments on teacher quality and teaching effectiveness perceived by students should be explored. Of course, if the relationships between teacher quality and teaching effectiveness, their influences and their prediction

power can be explored, useful teaching information can be offered to educational authorities as reference for follow-up related studies.

The purposes of this research are: (1) to explore the current statuses of "teacher quality" and "teaching effectiveness" as perceived by students, (2) to discover whether students' perception of "teacher quality" and "teaching effectiveness" differs with the background variables of students, (3) to analyze the relationship between "teacher quality" and "teaching effectiveness," and (4) to explore the prediction power of "teaching effectiveness" with "teacher quality" as the predictor.

2. LITERATURE REVIEW

2.1 The Ideal of Teacher Quality

Teacher quality is defined as teachers engaging in education tasks, with certain characteristics, and being able qualified to conduct teaching activities, arousing students' interest in learning, and enhancing students' learning achievements.

Ko (2003) believed that teacher quality is a general term for teacher cultivation, professional qualification and abilities. Peng (1999) believed the content of teacher quality can be categorized into: (1) common quality, (2) professional knowledge and abilities, (3) professional beliefs and attitude, (4) personality and (5) professional subject accomplishment. Wu (2003) divided the aspect of superior teacher quality into three categories: (1) knowledge, (2) abilities and (3) morals. Jian (1997) considered high quality teachers as teachers possessing: (1) knowledgeable cultivation, (2) teaching techniques and experiences, (3) ability to improve students' learning achievements and (4) promoting school effectiveness (Wright, Horn & Sanders, 1997). Summarizing the results from documentary analysis, it is concluded that, in this research, teacher quality should cover: (1) professional competence, (2) personality, (3) performance responsibility, (4) teacher-student interaction and (5) student problem handling.

2.2 The Ideal of Teaching Effectiveness

The research direction chosen for teacher teaching effectiveness includes two concepts: "teachers' self-effectiveness" and "teachers' effective teaching." "Teachers' self-effectiveness" is a sense of teachers subjectively evaluating their own teaching abilities, with influences on students' learning effects and expecting students to reach certain education goals (Feng, 2000). "Teachers' effective teaching" is defined as teachers making use of their knowledge and abilities at work, being particular about teaching methods, getting familiar with teaching materials, encouraging students, creating a fine learning environment and atmosphere, and helping students to achieve performance excellence in study (Lin, 2001; Korthagen, 2004; Borich, 1994). This is the direction chosen for this research.

It was found from related documentation that the categorizations differ with researchers' points of view. Medley (1979) believed that teachers with effectiveness should possess the following characteristics: (1) have a satisfying personality, (2) implement teaching methods efficiently, (3) create a fine learning atmosphere, (4) be proficient in all kinds of teaching abilities and (5) know when to use each kind of teaching ability (Flanders, 1970). Ryan (1989) pointed out that effective teaching should include: (1) planning strategies, (2) teaching strategies, (3) evaluation methods and (4) activity management. Moreover, teaching effectiveness can also be classified into: (1) content of systematic teaching materials, (2) diversified teaching techniques, (3) effective use of teaching time, (4) harmonious teacher-student relationship and (5) fine classroom atmosphere. Or into: (1) teaching plans and preparation, (2) teachers' professional knowledge, abilities and teaching techniques, (3) classroom management, (4) teaching outcomes and evaluation and (5) students' learning performance. Or into: (1) teaching plans, (2) teaching strategies, (3) classroom atmosphere management and (4) teaching outcomes (Chen, 1997; Tsai, 2001; Lu, 2004). In this research, according to the research purposes and the research summarized by scholars, teachers' teaching effectiveness is categorized into: (1) effective teaching behavior, (2) teaching strategy, (3) teaching outcomes and (4) classroom atmosphere management, as the basis from which to construct a scale.

2.3 Studies Related to Relationships between Teacher Quality and Teaching Effectiveness

An empirical study exploring factors related to teacher quality found that there is a positive relationship between teachers' performances in teaching and their scholastic ability. Furthermore, it was found that teachers' teaching assessments are positively related to teaching quality. A study about teachers' teaching effectiveness found significant differences in all the aspects of teaching effectiveness and overall teaching effectiveness for teachers of different seniorities, educational backgrounds, school sizes, school locations and job functions. Positive relationships were found between overall teachers' professional growth and all its aspects and teaching effectiveness, and teaching development and individual development can predict teaching effectiveness (Hellfritzch, 1945; LaDuke, 1945; Skinner, 1947).

2.4 Summary

After summarizing the documents above, it was found that there are many factors which may influence teachers' teaching effectiveness, including teachers' professional growth, guiding techniques, in-service training and job involvement. It is obvious that more and more attention has been paid to studies related to teachers' teaching effectiveness while more requests for education reformation have been received. In order to effectively improve teaching quality, academia has put a lot of continuous effort into studies related to teachers' teaching effectiveness. However, there is no complete system in Taiwan which can be used as a tool to evaluate

teachers' teaching effectiveness and offer references to successfully improve teachers' teaching effectiveness.

3. RESEARCH METHODS

3.1 Research Structure

The purpose of this research is to explore the relationship between teacher quality and teaching effectiveness perceived by students from industrial vocational high schools. Probes into the background variables, environmental variables, teacher quality variables and teaching effectiveness variables have been performed. The research structure is shown in Figure 1.
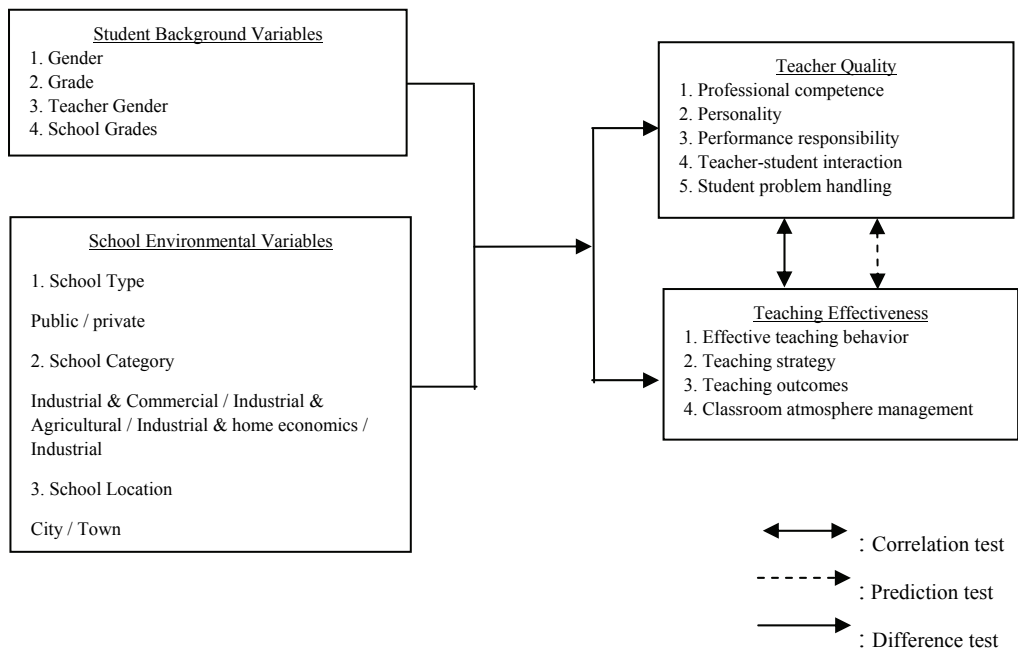

Figure 1. Research framework.

3.2 Research Subjects

Twenty-three schools were selected by stratified random sampling from the

research population of 154 industrial vocational high schools, as defined by the Ministry of Education in Taiwan. From each school a class of forty students was randomly selected as the research sample.

3.3 Research Tool and Implementation

By referencing related documentation, a "questionnaire of teacher quality and teaching effectiveness for industrial vocational high school teachers" was created as the research tool (Ko, 2003; Jian, Peng & Li, 1998; Shih, 2001; Chien, 2002; Li, 2003). Students' background variables included: (1) gender, (2) grade, (3) teacher gender and (4) school grades. The environmental variables included: (1) school type (private, public), (2) school category (industrial and commercial, industrial and agricultural, industrial and home economics, industrial) and (3) school location (city, town).

The questions were presented using a five-point Likert Scale of "strongly agree" (5 points), "agree" (4 points), "no comment" (3 points), "disagree" (2 points), and "strongly disagree" (1 point). The questions were answered according to students' feelings. Higher scores represent better feelings by the students about teacher quality and teaching effectiveness. Pre-tests and statistical analyses were performed on the questionnaires to determine their reliability and validity. Nine hundred and twenty questionnaires were sent out with 734 being retrieved, giving a response rate of 79.78%.

4. RESULTS AND DISCUSSIONS

The distributions of students' background variables and school environmental variables are presented in Table 1, with the data obtained from the valid questionnaires.

4.1 Analysis of the Current Status

The current statuses of "teacher quality" and "teaching effectiveness" as perceived by the students are satisfactory. In terms of teacher quality, "teacher-student interaction" has the best perception, while "classroom atmosphere management" is perceived as being the most important in teaching effectiveness (Table 2).

4.2 Gap Analysis

4.2.1 Student background variables

Male students' scores in "teacher quality" and "teaching effectiveness" perceived by students are both higher than female students'. This may be because industrial subjects are more strenuous for female students (Table 3). The teacher quality perceived by students differs significantly with students' grades, as does the

"teaching outcomes" of "teaching effectiveness" being perceived. Students of higher grades had a better perception (Table 4). Also, "teacher quality" perceived by students differs significantly with "teacher gender," and "teaching effectiveness" differs significantly with "teaching strategy" and "classroom atmosphere management". Female teachers' performance is better than male teachers' (Table 5). The "teacher-student interaction" of "teacher quality" being perceived differs most significantly with "school grades". Students with school grades higher than 90 points have the best perceptions. There is no significant difference in "teaching effectiveness" (Table 6).

Table 1. *Distributions of students' background variables and school environmental variables (N=734)*

Student background variables	Item	Number	%
Gender	male	557	75.9
	female	177	24.1
Grade	first grade	174	23.7
	second grade	242	33.0
	third grade	318	43.3
Teacher Gender	male	421	57.4
	female	313	42.6
School Grades	with intellectual education grade under 69 points	158	21.5
	from 70 to 79 points	358	48.8
	from 80 to 89 points	182	24.8
	above 90 points	36	4.9
School environmental variables	Item	Number	%
School type	public	526	71.7
	private	208	28.3
school category	industrial and commercial	375	51.1
	industrial and agricultural	180	24.5
	industrial and home economics	41	5.6
	industrial	138	18.8
school location	cities	290	39.5
	towns	444	60.5

Table 2. *Summary of the current status analysis for "teacher quality" and "teaching effectiveness" perceived by students (N=734)*

Teacher Quality	Average	SD	Items	Average/Item
Professional competence	22.21	4.83	6	3.70
Personality	23.24	4.66	6	3.87
Performance responsibility	15.04	3.39	4	3.76
Teacher-student interaction	19.57	3.54	5	3.91
Student problem handling	15.05	3.15	4	3.76
Teaching Effectiveness	Average	SD	Items	Average/Item
Effective teaching behavior	18.41	4.08	5	3.68
Teaching strategy	17.96	4.27	5	3.59
Teaching outcomes	18.54	3.88	5	3.71
Classroom atmosphere management	23.53	4.43	6	3.92

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Table 3. *Summary of t-test of "teacher quality" and "teaching effectiveness" for students of different gender*

Teacher Quality	Gender	Number	Mean	SD	t
Professional competence	male	557	3.70	.82	0.03
	female	177	3.70	.74	
Personality	male	557	3.91	.78	1.98*
	female	177	3.77	.77	
Performance responsibility	male	557	3.79	.85	1.59
	female	177	3.67	.83	
Teacher-student interaction	male	557	3.95	.70	2.25*
	female	177	3.81	.72	
Student problem handling	male	557	3.80	.78	2.19*
	female	177	3.65	.82	
Total	male	557	3.83	.69	1.71
	female	177	3.73	.68	
Teaching Effectiveness	Gender	Number	Mean	SD	t
Effective teaching behavior	male	557	3.72	.82	2.19*
	female	177	3.57	.81	
Teaching strategy	male	557	3.61	.85	0.85
	female	177	3.54	.87	
Teaching outcomes	male	557	3.73	.78	1.56
	female	177	3.63	.76	
Classroom atmosphere management	male	557	3.96	.71	2.45*
	female	177	3.80	.82	
Total	male	557	3.76	.70	1.99*
	female	177	3.64	.73	

Note. * $p < .05$.

Table 4. *Summary of "teacher quality" and "teaching effectiveness" perceived by students from different grades*

Teacher Quality	Group	Grade	Number	Mean	SD	F	Posterior Comparison
Professional competence	1	first	174	3.57	.82	4.25*	3>1
	2	second	242	3.68	.86		
	3	third	318	3.79	.74		
Personality	1	first	174	3.75	.83	2.92	
	2	second	242	3.90	.82		
	3	third	318	3.92	.71		
Performance responsibility	1	first	174	3.61	.87	4.20*	2>1
	2	second	242	3.85	.89		
	3	third	318	3.78	.79		
Teacher-student interaction	1	first	174	3.76	.77	5.58*	2>1 3>2
	2	second	242	3.97	.72		
	3	third	318	3.96	.65		
Student problem handling	1	first	174	3.71	.80	1.30	
	2	second	242	3.73	.83		
	3	third	318	3.82	.75		
Total	1	first	174	3.68	.72	3.92*	3>1
	2	second	242	3.82	.74		
	3	third	318	3.86	.61		

Table 4. *Summary of "teacher quality" and "teaching effectiveness" perceived by students from different grades (continued)*

Teaching Effectiveness	Group	Grade	Number	Mean	SD	F	Posterior Comparison
Effective teaching behavior	1	first	174	3.64	.76		
	2	second	242	3.72	.82	0.91	
	3	third	318	3.74	.75		
Teaching strategy	1	first	174	3.58	.86		
	2	second	242	3.70	.77	1.96	
	3	third	318	3.72	.82		
Teaching outcomes	1	first	174	3.46	.81		
	2	second	242	3.55	.92	5.18*	3>1
	3	third	318	3.70	.82		
Classroom atmosphere management	1	first	174	3.82	.76		
	2	second	242	3.95	.75	2.09	
	3	third	318	3.96	.72		
Total	1	first	174	3.63	.70		
	2	second	242	3.74	.73	2.72	
	3	third	318	3.79	.69		

Table 5. *Summary of t-test of "teacher quality" and "teaching effectiveness" perceived by students for different "teacher gender"*

Teacher Quality	Teacher Gender	Number	Mean	SD	t
Professional competence	male	421	3.65	.83	2.00*
	female	313	3.77	.76	
Personality	male	421	3.82	.78	2.04*
	female	313	3.94	.77	
Performance responsibility	male	421	3.69	.86	2.79*
	female	313	3.86	.83	
Teacher-student interaction	male	421	3.88	.71	1.65
	female	313	3.96	.71	
Student problem handling	male	421	3.71	.78	2.06*
	female	313	3.83	.79	
Total	male	421	3.75	.69	2.39*
	female	313	3.87	.67	
Teaching Effectiveness	Teacher Gender	Number	Mean	SD	t
Effective teaching behavior	male	421	3.67	.80	0.52
	female	313	3.70	.84	
Teaching strategy	male	421	3.53	.88	2.19*
	female	313	3.67	.81	
Teaching outcomes	male	421	3.68	.78	1.32
	female	313	3.75	.77	
Classroom atmosphere management	male	421	3.85	.75	3.14*
	female	313	4.02	.72	
Total	male	421	3.69	.71	2.05
	female	313	3.80	.70	

Note. * p < .05.

Table 6. *Summary of "teacher quality" and "teaching effectiveness" perceived by students with different school grades*

Teacher Quality	Group	School Grades	Number	Mean	SD	F	Posterior Comparison
Professional competence	1	under 69 points	158	3.71	.82	.51	
	2	70-79 points	358	3.67	.77		
	3	80-89 points	182	3.73	.81		
	4	above 90 points	36	3.82	1.07		
Personality	1	under 69 points	158	3.86	.82	1.68	
	2	70-79 points	358	3.82	.75		
	3	80-89 points	182	3.95	.75		
	4	above 90 points	36	4.05	.96		
Performance responsibility	1	under 69 points	158	3.77	.85	2.03	
	2	70-79 points	358	3.70	.83		
	3	80-89 points	182	3.85	.85		
	4	above 90 points	36	3.97	.95		
Teacher-student interaction	1	under 69 points	158	3.95	.76	3.23*	4>2
	2	70-79 points	358	3.86	.67		
	3	80-89 points	182	3.93	.69		
	4	above 90 points	36	4.23	.82		
Student problem handling	1	under 69 points	158	3.74	.84	.85	
	2	70-79 points	358	3.76	.76		
	3	80-89 points	182	3.78	.74		
	4	above 90 points	36	3.78	1.09		
Total	1	under 69 points	158	3.81	.72	1.39	
	2	70-79 points	358	3.76	.66		
	3	80-89 points	182	3.85	.67		
	4	above 90 points	36	3.97	.86		
Teaching Effectiveness	Group	School Grades	Number	Mean	SD	F	Posterior Comparison
Effective teaching behavior	1	under 69 points	158	3.67	.77	2.42	
	2	70-79 points	358	3.64	.79		
	3	80-89 points	182	3.71	.85		
	4	above 90 points	36	4.02	1.03		
Teaching strategy	1	under 69 points	158	3.67	.84	1.37	
	2	70-79 points	358	3.53	.83		
	3	80-89 points	182	3.61	.84		
	4	above 90 points	36	3.73	.22		
Teaching outcomes	1	under 69 points	158	3.67	.81	1.87	
	2	70-79 points	358	3.67	.72		
	3	80-89 points	182	3.76	.79		
	4	above 90 points	36	3.96	1.00		
Classroom atmosphere management	1	under 69 points	158	3.99	.73	2.24	
	2	70-79 points	358	3.86	.71		
	3	80-89 points	182	3.95	.73		
	4	above 90 points	36	4.10	.99		
Total	1	under 69 points	158	3.76	.69	2.00	
	2	70-79 points	358	3.69	.69		
	3	80-89 points	182	3.77	.72		
	4	above 90 points	36	3.96	.90		

Note. * $p < .05$.

4.2.2 School environmental variables

Both "teacher quality" and "teaching effectiveness" differ significantly with "school type," with students from private schools having a better perception (Table 7). "Teacher quality" differs significantly with "school category," with students from "industrial and commercial" schools having a better perception. There is no significant difference for "teaching effectiveness" (Table 8). "Teacher-student interaction" of "teacher quality" differs most significantly with "school location," with students from schools in towns having a better perception. There is no significant difference for "teaching effectiveness" (Table 9).

Table 7. *Summary of t-test of "teacher quality" and "teaching effectiveness" perceived by students for different school types*

Teacher Quality	School Type	Number	Mean	SD	t
Professional competence	public	526	3.65	.81	2.53*
	private	208	3.82	.79	
Personality	public	526	3.83	.75	2.61*
	private	208	3.99	.82	
Performance responsibility	public	526	3.70	.83	3.27*
	private	208	3.92	.87	
Teacher-student interaction	public	526	3.89	.70	1.42
	private	208	3.97	.73	
Student problem handling	public	526	3.70	.78	3.21*
	private	208	3.91	.80	
Total	public	526	3.76	.67	2.95*
	private	208	3.92	.71	
Teaching Effectiveness	School Type	Number	Mean	SD	t
Effective teaching behavior	public	526	3.67	.80	.78
	private	208	3.72	.85	
Teaching strategy	public	526	3.52	.86	3.87*
	private	208	3.78	.82	
Teaching outcomes	public	526	3.66	.77	2.48*
	private	208	3.82	.77	
Classroom atmosphere management	public	526	3.87	.72	3.01*
	private	208	4.05	.78	
Total	public	526	3.69	.70	2.87*
	private	208	3.85	.72	

4.3 Correlation Analysis

This research explores the relationship between "teacher quality" and "teaching effectiveness" perceived by students. From the results of statistical analysis, it was found that the correlation between them is positive ($r = 0.87$) and significant ($p<.01$), which means they are highly correlated (Table 10). The correlations between each variable of "teacher quality" perceived by students and "effective teaching behavior" of "teaching effectiveness" are significant and positive, with "professional competence" and "performance responsibility" having the highest correlation. The correlations between each variable of "teacher quality" perceived by students and "teaching strategy" of "teaching effectiveness" are significant and positive, with "professional competence" having the highest correlation. The correlations between each variable of "teacher quality" perceived by students and "teaching outcomes" of "teaching effectiveness" are significant and

positive, with "professional competence" and "performance responsibility" having the highest correlations. The correlations between each variable of "teacher quality" perceived by students and "classroom atmosphere management" of "teaching effectiveness" are significant and positive, with "personality" having the highest correlation.

4.4 Prediction Power Analysis

In this research, the "teacher quality" perceived by students is used as a predictor variable, while the "teaching effectiveness" perceived by students is used as the criterion variable for multiple stepwise regression analysis to explore the prediction power of "teaching effectiveness" by each variable of "teacher quality." "Professional competence," "performance responsibility," "teacher-student interaction" and "student problem handling" aspects of "teacher quality" perceived by students have significant predictive power for "effective teaching behavior," with 56.3% of the total variation being explained. "Professional competence" has the largest β value (β =.69) (Table 11).

Table 8. *Summary of "teacher quality" and "teaching effectiveness" perceived by students from schools of different "school categories"*

Teacher Quality	Group	School Category	Number	Mean	SD	F	Posterior Comparison
Professional competence	1	industrial & commercial	375	3.79	.81	3.54*	
	2	industrial & agricultural	180	3.63	.80		
	3	industrial & home economics	41	3.48	.60		
	4	industrial	138	3.62	.83		
Personality	1	industrial & commercial	375	3.93	.77	3.43*	1>3
	2	industrial & agricultural	180	3.81	.77		
	3	industrial & home economics	41	3.56	.77		
	4	industrial	138	3.90	.79		
Performance responsibility	1	industrial & commercial	375	3.84	.86	2.79*	
	2	industrial & agricultural	180	3.69	.79		
	3	industrial & home economics	41	3.50	.80		
	4	industrial	138	3.72	.89		
Teacher-student interaction	1	industrial & commercial	375	3.94	.71	2.67*	
	2	industrial & agricultural	180	3.97	.65		
	3	industrial & home economics	41	3.65	.69		
	4	industrial	138	3.86	.77		
Student problem handling	1	industrial & commercial	375	3.78	.77	1.06	
	2	industrial & agricultural	180	3.78	.77		
	3	industrial & home economics	41	3.55	.69		
	4	industrial	138	3.75	.88		
Total	1	industrial & commercial	375	3.86	.67	2.92*	
	2	industrial & agricultural	180	3.77	.66		
	3	industrial & home economics	41	3.55	.65		
	4	industrial	138	3.77	.74		

Table 8. *Summary of "teacher quality" and "teaching effectiveness" perceived by students from schools of different "school categories" (continued)*

Teaching Effectiveness	Group	School Category	Number	Mean	SD	F	Posterior Comparison
Effective teaching behavior	1	industrial & commercial	375	3.67	.87	2.29	
	2	industrial & agricultural	180	3.71	.73		
	3	industrial & home economics	41	3.39	.67		
	4	industrial	138	3.76	.80		
Teaching strategy	1	industrial & commercial	375	3.65	.87	1.59	
	2	industrial & agricultural	180	3.53	.86		
	3	industrial & home economics	41	3.44	.68		
	4	industrial	138	3.55	.85		
Teaching outcomes	1	industrial & commercial	375	3.74	.77	1.23	
	2	industrial & agricultural	180	3.66	.80		
	3	industrial & home economics	41	3.53	.59		
	4	industrial	138	3.70	.80		
Classroom atmosphere management	1	industrial & commercial	375	3.95	.75	1.69	
	2	industrial & agricultural	180	3.91	.71		
	3	industrial & home economics	41	3.68	.67		
	4	industrial	138	3.92	.74		
Total	1	industrial & commercial	375	3.77	.73	1.61	
	2	industrial & agricultural	180	3.71	.68		
	3	industrial & home economics	41	3.52	.59		
	4	industrial	138	3.75	.73		

Table 9. *Summary of t-test of "teacher quality" and "teaching effectiveness" perceived by students for different school locations*

Teacher Quality	School Location	Number	Mean	SD	t
Professional competence	city	290	3.66	.76	1.08
	town	444	3.73	.83	
Personality	city	290	3.83	.78	1.20
	town	444	3.90	.77	
Performance responsibility	city	290	3.71	.85	1.30
	town	444	3.79	.85	
Teacher-student interaction	city	290	3.44	.73	2.15*
	town	444	3.96	.69	
Student problem handling	city	290	3.74	.79	.62
	town	444	3.78	.79	
Total	city	290	3.76	.68	1.45
	town	444	3.83	.69	
Teaching Effectiveness	**School Location**	**Number**	**Mean**	**SD**	**t**
Effective teaching behavior	city	290	3.66	.78	.66
	town	444	3.70	.84	
Teaching strategy	city	290	3.56	.77	.77
	town	444	3.61	.91	
Teaching outcomes	city	290	3.67	.74	.97
	town	444	3.73	.80	
Classroom atmosphere management	city	290	3.86	.74	1.74
	town	444	3.96	.73	
Total	city	290	3.70	.67	1.17
	town	444	3.76	.73	

Note. * $p < .05$.

Table 10. *Summary of correlations between "teacher quality" and "teaching effectiveness" perceived by students*

Teaching Effectiveness Teacher Quality	Effective Teaching Behavior	Teaching Strategy	Teaching Outcomes	Classroom Atmosphere Management	Total
Professional competence	.68**	.73**	.71**	.72**	.74**
Personality	.64**	.67**	.65**	.76**	.76**
Performance responsibility	.68**	.71**	.71**	.71**	.80**
Teacher-student interaction	.65**	.63**	.66**	.74**	.75**
Student problem handling	.60**	.58**	.64**	.64**	.69**
Total	.80**	.76**	.77**	.83**	.87**

Table 11. *Summary of multiple stepwise regression analysis on "teacher quality" and "teaching effectiveness" perceived by students*

Order	Predictor Variable	R	R^2	ΔR^2	F	Raw Score Regression Coefficient	Standardized Regression Coefficient
1	Professional competence	.69	.47	.47	641.64***	.69	.69
2	Performance responsibility	.73	.53	.06	408.22***	.37	.38
3	Teacher-student interaction	.75	.56	.03	302.09***	.28	.24
4	Student problem handling	.75	.56	.01	230.82***	.11	.10

Note. *** $p < .001$.

"Professional competence," "performance responsibility," and "personality" aspects of "teacher quality" perceived by students have significant predictive power for "teaching strategies" with 51.9% of the total variation being explained. "Professional competence" has the largest β value (β =.67) (Table 12). "Performance responsibility," "professional competence," "student problem handling," and "teacher-student interaction" aspects of "teacher quality" perceived by students have significant predictive power for "teaching effectiveness" with 61.3% of the total variation being explained. "Performance responsibility" has the largest β value (β =.72) (table 13).

"Performance responsibility," "personality," "teacher-student interaction" and "Professional competence" aspects of "teacher quality" perceived by students have significant predictive power for "classroom atmosphere management" with 69.4% of the total variation being explained. "Performance responsibility" has the largest β value (β =.75) (Table 14). "Performance responsibility," "professional competence," "teacher-student interaction," "personality," and "student problem handling" aspects of "teacher quality" perceived by students have significant predictive power for "teachers' teaching effectiveness" with 77.1% of the total variation being explained. "Performance responsibility" has the largest β value (β =.31) (Table 15).

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Table 12. *Summary of multiple stepwise regression analysis on "teacher quality" and teachers' "teaching strategy" perceived by students*

Order	Predictor Variable	R	R^2	ΔR^2	F	Raw Score Regression Coefficient	Standardized Regression Coefficient
1	Professional competence	.67	.45	.45	589.79***	.75	.67
2	Performance responsibility	.71	.51	.06	372.66***	.40	.38
3	Personality	.72	.52	.01	258.11***	.19	.16

Note. *** p < .001.

Table 13. *Summary of multiple stepwise regression analysis on "teacher quality" and "teaching outcomes" perceived by students*

Order	Predictor Variable	R	R^2	ΔR^2	F	Raw Score Regression Coefficient	Standardized Regression Coefficient
1	Performance responsibility	.72	.51	.51	747.64***	.66	.72
2	Professional competence	.76	.58	.07	492.43***	.39	.41
3	Student problem handling	.78	.61	.03	360.90***	.21	.21
4	Teacher-student interaction	.78	.61	.00	281.93***	.17	.15

Note. *** p < .001.

Table 14. *Summary of multiple stepwise regression analysis on "teacher quality" and "classroom atmosphere management" perceived by students*

Order	Predictor Variable	R	R^2	ΔR^2	F	Raw Score Regression Coefficient	Standardized Regression Coefficient
1	Performance responsibility	.75	.57	.57	942.15***	.66	.75
2	Personality	.81	.66	.09	680.91***	.41	.43
3	Teacher-student interaction	.83	.69	.03	519.68***	.28	.27
4	Professional competence	.83	.69	.00	401.65***	.13	.14

Note. *** p < .001.

5. CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

5.1.1 Current status

The current statuses of "teacher quality" and "teaching effectiveness" as perceived by students are satisfactory. From the aspect of teacher quality, "teacher-student interaction" has the best perception, as has "classroom atmosphere management" from the aspect of teaching effectiveness.

Table 15. *Summary of multiple stepwise regression analysis on "teacher quality" and teachers' "teaching effectiveness" perceived by students*

Order	Predictor Variable	R	R^2	ΔR^2	F	Raw Score Regression Coefficient	Standardized Regression Coefficient
1	Performance responsibility	.80	.65	.65	1338.86***	.26	.31
2	Professional competence	.85	.73	.08	978.21***	.25	.28
3	Teacher-student interaction	.87	.76	.03	770.07***	.19	.19
4	Personality	.88	.77	.01	490.95***	.10	.11
5	Student problem handling	.88	.77	.00	601.71***	9.617E-02	.11

Note. *** $p < .001$.

5.1.2 Differences
(1) Gender

Male students' perception of "teacher quality" and "teaching effectiveness" is better than female students'.
(2) Grade

From the aspect of "teacher quality," third-grade students' perceptions are better than first-grade students'. Secondly, (a) third-grade students' perceptions of teachers' "professional competence" are better than first-grade students'. (b) Second-grade students' perceptions of teachers' "performance responsibility" are better than first-grade students'. (c) Second-grade students' perceptions of "teacher-student interaction" are better than first-grade students' and third-grade students' are better than second-grade students'. From the aspect of teaching effectiveness, third-grade students' perceptions of teachers' "teaching outcomes" are better than first-grade students'.
(3) Teacher gender

Students' perceptions of female teachers' "teaching effectiveness" are better than male teachers'.
(4) School grades

From the aspect of "teacher-student interaction" of "teacher quality" perceived by students, the perception by students with grades over 90 points is better than students with grades of 70~79 points. There are no significant variables in "teaching effectiveness."
(5) School type

The perception of both "teacher quality" and "teaching effectiveness" by students from private schools is better than students from public schools.

(6) School category

From the aspect of "teacher quality," (a) the perception of "professional competence," "personality," "performance responsibility" by students from "industrial and commercial" schools is the best. (b) The perception of "teacher-student interaction" by students from "industrial and agricultural" schools is the best. There are no significant variables in "teaching effectiveness."

(7) School location

From the aspect of "teacher quality," the perception of "teacher-student interaction" by students from schools in towns is better. There are no significant variables in "teaching effectiveness."

5.1.3 The correlations of students' perception

The correlation between "teacher quality" and "teaching effectiveness" perceived by students is positive and significant. The correlation is high, which means a better perception of "teacher quality" by students, and a better perception of teachers' "teaching effectiveness."

(1) Effective teaching behavior

The correlation between each variable of "teacher quality" perceived by students and "effective teaching behavior" is positive and significant. This means a better perception of each variable of "teacher quality" by students, and a better perception of teachers' "effective teaching behavior" of "teaching effectiveness."

(2) Teaching strategy

The correlation between each variable of "teacher quality" perceived by students and "teaching strategy" is positive and significant. This means a better perception of each variable of "teacher quality" by students, and a better perception of teachers' "teaching strategy" of "teaching effectiveness."

(3) Teaching outcomes

The correlation between each variable of "teacher quality" perceived by students and "teaching outcomes" is positive and significant. This means a better perception of each variable of "teacher quality" by students, and a better perception of teachers' "teaching outcomes" of "teaching effectiveness."

(4) Classroom atmosphere management

5.1.4 Prediction power perceived by students

The variables of "teacher quality" perceived by students can be used to predict the overall "teaching effectiveness" but the prediction power differs with criterion variables. The highest prediction power comes with the variables "professional competence," "personality," "performance responsibility," "teacher-student interaction" and "student problem handling." This means if the prediction power of "teaching effectiveness" by "teacher quality" is high for a school, then it can be found that teachers' effectiveness performances are excellent.

5.2 Suggestions

5.2.1 Education units

(1) Setting up evaluation indexes

The current statuses of "teacher quality" and "teaching effectiveness"

perceived by students are satisfactory, and the relationship between "teacher quality" at industrial vocational high schools and "teaching effectiveness" is very close. Therefore, it is suggested that education units should set up indices which fit the teaching effectiveness of industrial vocational high school teachers, as   references for teachers' competence improvement and the standard for the implementation of a teacher performance evaluation system.

(2) Teacher performance evaluation

The higher grade the students are in, the more teachers' teaching effectiveness can be perceived by them. That is to say, the more students grow, the more teachers' teaching effectiveness they can perceive. Therefore, it is suggested that the system of teacher performance evaluation by high-grade students should be implemented, in order to ensure better learning conditions for students.

5.2.2 Vocational high schools

(1) Encouraging teachers' professional growth

The prediction power of "effective learning behavior" by teachers' "professional competence" is high. Learning channels can be established for teachers' self-discipline, maintaining the sensitivity of the profession, achieving high-quality professional development, helping students improve learning effects, and improving "teacher quality" and "teaching effectiveness."

(2) Periodically commending outstanding teachers

The prediction power of "classroom atmosphere management" and "teaching outcomes" by teachers' "performance responsibility" is high. Therefore, it is suggested that schools should periodically recommend outstanding teaching to improve teaching performance responsibility.

5.2.3 Vocational high school teachers

(1) Improving teaching strategy

The relationship between "teacher quality" of industrial vocational high schools and "teaching effectiveness" is positive. Therefore, it is suggested that teachers can examine whether their own teaching strategies have met the requirements of high quality through a teacher performance system in order to understand their own "teaching behavior" and improve "teaching effectiveness."

(2) Improving teacher-student interaction

The "teacher-student interaction" and "classroom atmosphere management" perceived by students from private schools are better than students from public schools. Therefore it is suggested that, through inter-school activities, public school teachers can inspect and learn from each other's work, exchanging opinions and sharing experiences, and improving "teacher quality" and "teaching effectiveness."

(3) Pay more attention to female students

Male students' perception of "teacher quality" and "teaching effectiveness" is better than female students'. It is suggested that teachers should pay more attention to female students' learning reactions, giving them timely help to provide better learning perception.

(4) Male teachers should improve professional competence of teacher quality

Students' perception of female teachers' "teaching effectiveness" is better than male teachers'. It is suggested that male teachers should try to improve their

performance in their professional areas, in order to achieve higher "teaching effectiveness."

5.2.4 Future researches

(1) Research subjects

In the future, if research subjects can include those from elementary schools, high schools, or universities, more detailed and accurate results from exploring relationships between teacher quality and teaching effectiveness will be obtained.

(2) Research methods

In the future, if research methods can include in-depth interviews, field observations, or quantitative analyses, the data obtained will be more diversified. This way the understanding of the potential factors which influence relationships between industrial vocational high school teacher quality and teaching effectiveness can be deeper.

(3) Research variables

Variables which can be included in the future are: variables related to parents' perceptions. With future discussion, factors with influences on teacher quality and teaching effectiveness can be more deeply explored.

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