

An analysis of the key factors of high-quality instruction of teachers in institutes of technology

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ABSTRACT: The perception of students in institutes of technology regarding key factors of teachers' high-quality instruction was analysed for this study. The results and findings could serve as a reference for institutes of technology to effectively enhance instructional quality plans and improve school operations. Thus, for this study, the students of institutes of technology were treated as subjects, and their degrees of satisfaction with teachers' instructions and their expectations toward other aspects that could be improved, were collected by questionnaire survey. Findings demonstrate that the key factors of students' satisfaction with instruction are as follows: serious instructional attitude, rich instructional content, and positive teacher-student interaction; while they expect other aspects could be improved: stimulation of learning interests, clear explanations and demonstrations, and recognition of students' satisfaction levels. Students' satisfaction with instruction is higher regarding female teachers, full-time and administrative teachers, colleges of engineering, elective courses and general knowledge courses.

INTRODUCTION

Enhancement of instructional quality is the key to school innovation when facing current global markets, and in encountering changes to industrial environments, fewer children and homogeneous competition with ordinary universities, institutes of technology should enhance hardware investment and teachers' competence in high-quality instruction in order to satisfy students' needs [1-3].

High-quality instruction means teachers accomplish instructional goals and strengthen students' meaningful learning through a series of planned instructional activities, such as preparation, curriculum design, teacher-student interaction, instructional activities and evaluation. High-quality instruction should be based on students' learning intentions and efforts, instructional social support and assistance, as well as instructional and learning opportunities and resources. These, in conjunction with positive interactions, mean better instruction will be realised [4][5].

Institutes of technology emphasise cooperation with industries, and, in addition to cultivation of a technical workforce, stimulation of creativity, and the construction of a team work consciousness, high-quality instruction is also required to enhance students' learning outcomes and *core competence* for sustainable operations of schools [6]. Factors of higher education and learning include administrative support, equipment, curriculum design, selection of teaching materials, teachers' traits, and teacher-student interactions, etc. High-quality instruction is an indicator of school service quality able to meet the demands and needs of students. Evaluation of high-quality instruction could discover instructional outcomes and areas of improvement for instructional processes [7][8].

In the recent years of educational liberation and changes to educational environments, as well as industrial structures turning from labour-intensive to technique-intensive, and from capital-intensive to a knowledge economy, it is important for institutes of technology to reconstruct their educational characteristics [9]. Because of a low birth-rate and the expansion of higher education, to meet industrial changes and workforce demands, institutes of technology should analyse students' perceptions of high-quality instruction in schools in order to recognise their demands for university educational functions, enhanced high-quality instruction and innovative instruction for sustainable operations.

Based on the motivations above, the research purposes were:

- To probe the satisfaction levels of students in institutes of technology in order to ensure high-quality instruction, and identify any aspects that could be improved.
- To analyse differences regarding satisfaction levels of students in institutes of technology, in order to ensure that high-quality instruction of teachers satisfies different backgrounds, and identify any aspects that could be improved.

According to the findings, this research puts forward suggestions regarding the expectations of students in institutes of technology toward high-quality instruction.

METHODS AND IMPLEMENTATION

Research Subjects

This study treated 1,412 students and graduate students in institutes of technology as research subjects by cluster random sampling, including 1,239 university students (83.2%) and 250 graduate students (16.8%). The number of questionnaires distributed was 1,550 and 1,502 were returned, with 1,489 being effective; the valid return rate was 96.06%. Regarding processes of sampling, according to statistics from the Ministry of Education, under this research, systematic encoding was first conducted on 2,198 classes in institutes of technology in Taiwan in order to ensure they met the scope of this study, and then they were reorganised in the order of sampling [10]. Second, the classes were selected by random computer cluster sampling. All students in the subject classes were investigated. Finally, calculations of the minimum number of samples were based on the formula suggested by Krejcie and Morgan [11].

Research Tool

The research tool was called *Survey of views of students in institutes of technology on high-quality instruction*. Two experts were invited to examine the content in the questionnaires to ensure expert validity. Five students from institutes of technology were invited to complete the questionnaires in order to recognise their readability and enhance content validity. The questionnaire included two sections, as follows:

- Basic information on courses: teachers' gender, teachers' position (full-time and administrative teachers, full-time teachers, and part-time teachers); colleges (colleges of management, engineering, humanities and design); type of courses (obligatory, elective courses and general knowledge courses); and educational system (university students and graduate students).
- Students' views on instruction and aspects needing improvement: there are 16 formal items, including proposals of instructional plans, serious instructional attitudes, positive teacher-student interactions, recognition of students' satisfaction levels, rich instructional content, clear explanations and demonstrations, good control of schedule, punctuality, flexible teaching, stimulation of learning interests, adequate assignments, multiple evaluations, use of instructional resources, after-class tutorials, respect for students' reactions and teachers' proper manners. The scale was modified by an expert focus group. According to satisfaction and expectations, the participants could choose *agree* or *disagree* regarding the 16 items.

Data Analysis

This study acquired the means and standard deviations of the scores, and conducted difference analysis by *t*-test and one-way ANOVA in order to recognise the satisfaction and expectations of students regarding high-quality instruction of teachers, under different genders, positions, colleges and types of course.

RESULT AND DISCUSSIONS

Analysis of Students' Satisfaction of High-quality Instruction and Expectations of Items Needing Improvement

In Table 1, regarding students' satisfaction with items of high-quality instruction, more than 60% view positively teachers' *serious instructional attitude* and *rich instructional content*; and 30%–40% view positively instructional skills and curriculum arrangement. However, less than 20% agreed with teachers' after-class tutorial; which implies that in the future, teachers could further improve instructional skills and curriculum arrangements, and, in particular, enhance after-class tutorials. Regarding students' expectations toward items needing improvement, 8.76%–10.07% students indicated *stimulation of learning interests* and *clear explanations and demonstrations*, which implies that in the future, teachers could enhance students' learning interests and their explanations and demonstrations during courses, and, in particular, trigger students' learning interest.

Based on the above, students' items of satisfaction are in the following order: *serious instructional attitude*, *rich instructional content* and *positive teacher-student interaction*, which demonstrates that students' perceptions of instruction are based on instructional skills and attitudes related to learning outcomes [12–14].

However, it is noticeable that among the items needing improvement and satisfaction items, *after-class tutorials* is insignificant for students; in other words, students are not satisfied with *after-class tutorials*, and do not expect it needs improvement. Research should further determine if the following applies: students are not familiar with teachers; after-class tutorials are not what students need; or after-class tutorials require assistants or other measures.

Analysis of Students' Views of the impact of High-quality Instruction on Different Backgrounds

Analysis of students' views of the impact of high-quality instruction on different backgrounds is shown in Table 1. The analytical results are described below.

Table 1: Analysis of students' views of the impact of high-quality instruction on different backgrounds.

Content of perception Items	Items satisfied		Items needing to be improved		Different background variables									
	%	Order	%	Order	Gender		Position		College		Courses		Educational system	
					Items satisfied	Items to be improved	Items satisfied	Items to be improved	Items satisfied	Items to be improved	Items satisfied	Items to be improved	Items satisfied	Items to be improved
1. Proposal of instructional plans	48.7%	5	4.1%	1 1	n.s.	n.s.	1>2, 2>3	3>2	2>4 ,4>1	n.s.	2>1, 2>3	1>2	2>1	n.s.
2.Serious instructional attitude	67.7%	1	3.9%	1 2	2>1	n.s.	n.s.	n.s.	n.s.	n.s.	2>1, 2>3	1>2	2>1	1>2
3.Positive teacher-student interactions	50.9%	3	4.9%	8	2>1	n.s.	1>2, 1>3	n.s.	2>1, 2>3 4>2	n.s.	2>1, 2>3	1>2	2>1	1>2
4. Recognition of students' levels	30.5%	1 4	8.2%	3	n.s.	n.s.	1>3, 2>3	2>3	2>4	n.s.	2>1, 1>3, 2>3	1>2, 1>3	2>1	1>2
5.Rich instructional content	52.3%	2	6.0%	5	n.s.	2>1	1>3, 2>3	n.s.	n.s.	3>2, 3>4	2>1, 2>3	1>2	2>1	n.s.
6.Clear explanations and demonstrations	48.9%	4	8.8%	2	n.s.	n.s.	1>2	2>1	n.s.	1>2	2>1, 2>3	1>2	2>1	1>2
7.Good control of schedule	39.3%	9	4.6%	9	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	2>1 ,2>3	1>2	2>1	n.s.
8.Punctuality	43.1%	6	4.5%	1 0	n.s.	n.s.	n.s.	n.s.	2>1	n.s.	n.s.	n.s.	2>1	n.s.
9. Flexible teaching	39.9%	8	6.9%	4	2>1	n.s.	n.s.	n.s.	2>1, 2>3, 4>2	n.s.	2>1	1>2, 1>3	2>1	1>2
10.Stimulation of learning interests	35.8%	1 2	10.1%	1	n.s.	n.s.	1>2	1>2, 1>3	2>1, 3>2, 3>4	n.s.	2>1, 2>3	1>2, 1>3	2>1	1>2
11.Adequate assignments	33.2%	1 3	5.3%	7	2>1	n.s.	n.s.	2>3	n.s.	3>2, 2>4, 1>4 3>4	2>1, 2>3	1>2, 1>3	2>1	1>2
12.Multiple evaluations	26.3%	1 5	3.7%	1 3	2>1	2>1	1>2, 1>3	n.s.	2>1	n.s.	2>1, 2>3	1>2, 1>3	2>1	1>2
13.Use of instructional resources	36.2%	1 1	3.3%	1 4	2>1	n.s.	2>3	n.s.	2>1, 3>1	4>1	2>1	n.s.	2>1	n.s.
14.After-class tutorials	19.1%	1 6	3.3%	1 5	n.s.	n.s.	1>3, 2>3	2>1, 2>3	2>1, 3>1, 1>4 3>2, 3>4	1>2	2>1, 2>3	n.s.	2>1	n.s.
15. Respect for students' reactions	41.2%	7	5.8%	6	2>1	n.s.	n.s.	n.s.	2>1, 2>4	n.s.	2>1, 2>3	1>2, 1>3	2>1	1>2
16. Teachers' proper manners	38.1%	1 0	2.1%	1 6	n.s.	n.s.	1>3	n.s.	2>1, 2>4	4>1	2>1, 2>3	1>2	2>1	1>2
Total	40.7%		5.34%		n.s.	n.s.	1>3	n.s.	2>1, 2>4	n.s.	2>1, 2>3	1>2, 1>3	2>1	1>2
Remarks					1. Male 2. Female		1. Full-time and administrative 2. Full-time 3. Part-time		1. College of humanities 2. College of engineering 3. College of design 4. Colleges of management		1. Obligatory courses 2. Elective courses 3. General Knowledge courses		1. University students 2. Graduate students	

Analysis of Students' Views on Male and Female Teachers' High-quality Instruction

As to students' views on male and female teachers' high-quality instruction, they show that teachers are significantly different in terms of *serious instructional attitude* ($t=-2.196$), *positive teacher-student interactions* ($t=-2.131$), *flexible teaching* ($t=-2.151$), *adequate assignments* ($t=-2.343$), *multiple evaluations* ($t=-2.532$), *use of instructional resources* ($t=-1.976$), and *teachers' proper manners* ($t=-3.301$), and the remaining items do not reveal significant differences. It shows that students suggest female teachers are better than male teachers regarding *serious instructional attitude*, *positive teacher-student interaction*, *flexible teaching*, *adequate assignments*, *multiple evaluations*, *use of instructional resources* and *teachers' proper manners*. In other words, students tend to agree with female teachers' instructional attitudes, skills and teacher-student interactions.

Based on the above, students are more satisfied with female teachers than male teachers, and this indicates that female teachers' instructions are generally accepted by students. According to the research of Fitzpatrick, Sanders and Worthen, males and females are significantly different. Male teachers tend to attract students through their humour; female teachers usually care for students, and they are tender and careful; thus, gender will influence the analytical results. However, male and female characteristics can be shown in instructions to reduce the differences in analytical results [15].

Analysis of Students' Views on High-quality Instruction of Teachers with Differing Tenure

Students' views on high-quality instructions of teachers who work either full or part-time produced these results: *proposal of instructional plans* ($F=29.553$), *positive teacher-student interaction* ($F=5.910$), *recognition of students' levels* ($F=6.344$), *rich instructional content* ($F=9.000$), *clear explanations and demonstrations* ($F=4.039$), *stimulation of learning interests* ($F=6.424$), *multiple evaluations* ($F=6.012$), *use of instructional resources* ($F=5.033$), *after-class tutorial* ($F=14.829$), *teachers' proper manners* ($F=3.838$), and a *total* of ($F=6.021$, $p<.05$, respectively). According to the results of students' views on high-quality instruction of teachers holding either full-time or part-time posts, students are more satisfied with *full-time and administrative teachers* than with *full-time teachers* or *part-time teachers*; and they are more satisfied with *full-time teachers* than with *part-time teachers*, which implies that regarding perceptions of instruction, students are more satisfied with full-time and administrative teachers; and less satisfied with part-time teachers. In other words, *part-time teachers* should enhance their instructional attitudes, skills, teacher-student interactions and evaluations.

As to analytical results of students' views on high-quality instruction of teachers holding either full-time or part-time posts, *proposal of instructional plans* ($F=3.475$), *recognition of students' levels* ($F=4.080$), *clear explanations and demonstrations* ($F=3.872$), *stimulation of learning interests* ($F=5.858$), *adequate assignments* ($F=6.531$), and *after-class tutorials* ($F=7.491$, $p<.05$, respectively) reveal significant differences. According to analytical results of students' expectations toward items needing improvement, generally speaking, students' expectations of *full-time teachers* are greater than for *full-time and administrative teachers* or *part-time teachers*, and this implies full-time teachers should enhance the above items.

Based on the above, students are more satisfied with full-time and administrative teachers than with full-time and part-time teachers. Findings of this study demonstrate that full-time and administrative teachers are experienced, and they can clearly recognise students' learning demands and help students with multiple learning issues through administrative and instructional resources. Thus, students are more satisfied with their high-quality instruction [16].

Analysis of Students' Views on High-quality Instruction of Teachers in Different Colleges

The results of students' views on high-quality instruction of teachers in different colleges show: *proposal of instructional plans* ($F=10.442$), *positive teacher-student interaction* ($F=19.889$), *recognition of students' levels* ($F=3.942$), *punctuality* ($F=4.495$), *flexible teaching* ($F=13.126$), *stimulation of learning interests* ($F=9.461$), *multiple evaluations* ($F=3.634$), *use of instructional resources* ($F=5.310$), *after-class tutorial* ($F=11.747$), *respect for students' reactions* ($F=12.083$), *teachers' proper manners* ($F=13.306$), and a *total* of ($F=6.483$, $p<.05$, respectively) reveal significant differences. After comparing the results of different colleges, it was found that teachers in colleges of engineering meet with more satisfaction in items of instruction, as do colleges of management, colleges of design and colleges of humanities.

The research showed that teachers in colleges of engineering gained higher scores in satisfaction with instruction and the items of satisfaction. Teachers in colleges of design gained higher scores on items needing improvement, and the reasons are as follows. First, students in different colleges major in differing subjects, thus, college differences will influence the results of evaluation. Evaluation scores of science and engineering departments are lower than those of non-science and engineering [17]. Second, in departments such as education, law, art and health, that result in more students in the workplace and high degrees of department-related jobs, the graduates tend to be more satisfied with a university education that benefits their jobs [18]. Third, colleges of science are more satisfied with teachers' proposals on effective learning approaches and instruction. Colleges of engineering and humanities are more satisfied with teachers' instructions [17]. Predictions of students' active learning (academic support, use of measures, interaction with

teachers, academic activities, and contribution in and out of class) are more significant to academic success than passive learning. From this study, it is inferred that courses of colleges of engineering in institutes of technology are project- and practical-orientated, and that students are allowed to contribute to academia and interpersonal integration. Thus, students will be more satisfied with instruction [13][14].

Analysis of Students' Views of High-quality Instruction in Obligatory and Elective Courses

As for the analytical results of students' views of high-quality instruction in obligatory and elective courses, the study shows: *proposal of instructional plans* ($F=79.638$), *serious instructional attitude* ($F=39.032$), *positive teacher-student interaction* ($F=51.473$), *recognition of students' levels* ($F=62.551$), *rich instructional content* ($F=72.655$), *clear explanations and demonstrations* ($F=57.670$), *good control of schedule* ($F=22.525$), *flexible teaching* ($F=48.380$), *stimulation of learning interests* ($F=92.820$), *adequate assignments* ($F=40.682$), *multiple evaluations* ($F=39.871$), *use of instructional resources* ($F=29.742$), *after-class tutorial* ($F=27.847$), *respect for students' reactions* ($F=40.661$), *teachers' proper manners* ($F=21.742$), and a total of ($F=76.028$, $p<0.05$, respectively) reveal significant differences. Generally speaking, students are more satisfied with elective courses than obligatory courses; they are more satisfied with elective courses than general knowledge courses. Only in regard to *recognition of students' levels* and *good control of schedule*, are students more satisfied with elective courses than general knowledge courses. In other words, students are more satisfied with elective courses and general knowledge courses, and are less satisfied with obligatory courses.

Students, then, are more satisfied with instruction in elective courses, with the highest scores, followed by general knowledge courses and obligatory courses; as to the items needing improvement, the scores on obligatory courses are the highest, followed by general knowledge courses and elective courses. The reason could be that students voluntarily selected elective courses in which they have more learning motivation and interests and, thus, they highly value the teachers. However, students are forced to take obligatory courses, and may not evaluate teachers highly, even those who teach well [19]. The difficulty and frequency of assignments and exams will influence the satisfaction of students in institutes of technology with learning outcomes. The inference from this study is that there are implications for instructional objectives on a serial curriculum in obligatory courses because they have more assignments and exams than do elective courses. In addition, students' prior abilities in basic obligatory courses are different. Since elective courses are offered for sophomores (second-year students) and above, students are more familiar with learning strategies and cognitive models of university courses, and they are more satisfied with elective courses [20][21].

Analysis of Students' Views on High-quality Instruction in Different Academic Systems

The analytical results of students' views on high-quality instruction in different educational systems, show that 16 items reveal significant differences ($p<0.05$). Graduate students are more satisfied with teachers' high-quality instruction than are university students. Generally speaking, graduate students are more satisfied with teachers' instructional content, attitude, interaction and evaluation, than are university students. Thus, graduate students tend to agree with teachers' instruction.

The size of a class is negatively related to evaluation scores of teachers' instruction. From related research, there are 30-50 students in one class in colleges and universities, and 1-25 students in one class in graduate schools.

Teacher-student interactions are more frequent in small classes, and less frequent in large classes. In addition, university students are 18-23 years old, and young people are more emotional. Graduate students are more than 23 years old and, as adults, are more rational and calm. Regarding academic learning, graduate students have specific goals of careers in definite research fields, and since they are required to obtain a degree within 2-3 years, their learning is more active and they will approach teachers with academic issues. Thus, their learning motivation is more significant than university students, and they tend to evaluate positively teachers' high-quality instruction. Most university students are uncertain about their careers, and their learning is influenced by colleagues and interests, hence, their learning is less active. As a result, their evaluation of teachers will be slightly lower than graduate students. These two groups' questionnaire results are thus different [22].

CONCLUSIONS AND RECOMMENDATIONS

According to the analysis of students' views of teachers' high-quality instruction, the following is concluded in this research.

On high-quality instruction, students are most satisfied with teachers' *serious instructional attitude*; and teachers' *stimulation of learning interests* should be improved. Students are more satisfied with a *serious instructional attitude*, and satisfaction with items of teachers' high-quality instructions are: *rich instructional content*, *positive teacher-student interactions*, *clear explanations and demonstrations*, *proposal of instructional plans*, *punctuality*, and *respect for students' reactions*. Most students suggest that teachers lack *stimulation of learning interests*, and the items needing improvement are: *clear explanations and demonstrations*, *recognition of students' levels*, *flexible teaching*, *rich instructional content*, *respect for students' reactions* and *adequate assignments*.

Students are more satisfied with female teachers, full-time and administrative teachers, colleges of engineering, elective courses and general knowledge courses. The findings demonstrate students' different views on the effect of high-quality instruction upon different backgrounds. First, students of institutes of technology are more satisfied with female teachers than males. Regarding the items needing improvement, students' expectations of female teachers are higher than that of male teachers; in addition, students of institutes of technology are the most satisfied with full-time and administrative teachers and less satisfied with part-time teachers.

As to items needing improvement, students have high expectations of full-time teachers and lower expectations of full-time and administrative teachers; regarding students' views on high-quality instruction of teachers in different colleges, students are more satisfied with teachers in colleges of engineering, namely, colleges of management, colleges of design and colleges of humanities. With regard to items needing improvement, teachers in colleges of design should improve the most, namely in colleges of humanities, colleges of management and colleges of engineering; in addition, students of institutes of technology are the most satisfied with elective courses and general knowledge courses, and they expect obligatory courses to be improved the most; finally, with regard to students of institutes of technology in different *educational systems*, graduate students are more satisfied with high-quality instruction than are university students. Compared with graduate students, university students expect more course improvements.

According to the results and findings of this study, the suggestions for future instructional enhancement and evaluations are as follows.

Evaluations should be multiple in order to improve instructional problems; and their aims must be varied and in accord with real life requirements. With regard to instructional evaluations, because professional fields differ in colleges and departments, and knowledge structures and instructional objectives are various, the evaluation content and method must be set according to these different characteristics in order to result in true instructional evaluation.

Enhancing teacher-student interactions by personal traits: male teachers impress students through their humour, and female teachers are more tender and cautious. Genders differ in characteristics; teachers show their personal traits during the courses and provide diverse instructions. The effects of lectures are limited, and teachers can boost their efforts in this regard through workshops of high-quality instruction or through assistance and stimulation from a professional teachers' community and rewards for prominent teachers. Thus, university teachers would be motivated to attend to enhancement of instructional quality and techniques.

Planning teachers' exchange of instructional experiences: Teachers holding varying tenure can share their instructional skills. This study has demonstrated that students' evaluation of full-time and administrative teachers' high-quality instruction is the highest. Besides teaching, full-time and administrative teachers must also undertake administrative jobs, thus, they have heavy workloads, and students are highly satisfied with them even though they are busy at work. They can share their experience with full-time and part-time teachers in order to enhance overall satisfaction with instruction.

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