



Analysis of Item Difficulty Orientation and Testees' Performance for the TVE Joint College Entrance Examination

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ABSTRACT

To cope with the implementation of the Curriculum Guidelines of 12-year Basic Education (108 Syllabus for short), core competence was based for curriculum development. Credits of the required specialty and practice courses for technological vocational senior high schools were adjusted by the MOE. The learning goals of each group and the trend of item difficulty could be assessed through an understanding of the items in the TVE Joint College Entrance Examination. Test items for the Business and Administration Category and the Hospitality-major Category of 4-year and 2-year TVE Joint College Entrance Examinations from academic years 109 to 111 were studied via the item analysis data provided by the Testing Center for Technological and Vocational Education to inspect the item operation techniques and response of students from these two groups and to know item difficulty and students' performance.

Due to specialty practice orientation, diverse competencies, and increases of interdisciplinary subject integration and practice application directed items and item word counts, the item difficulty indexes of specialty subjects and students' performance of the Business and Administration Category and the Hospitality-major Category from academic years 109 to 111 were described as follows:

1. Because the vocational subject (1) of the Business and Administration Category was also taken by the students from the study area of Foreign Languages, items tended to become more difficult with a decrease in easy items.

2. For the vocational subject (2) of the Business and Administration Category, the unit themes required for senior high school students were divided specifically in the Curriculums and the contents that belonged to the college level in the old curriculums were excluded. Item difficulty tended to decrease slightly with an increase of easy items; however, a steady item difficulty was still maintained.

3. As far as the vocational subject (1) of the Hospitality-major Category was concerned, item counts on specialty English and integration increased and the reading comprehension of students varied. Therefore, items tended to become more difficult with a decrease in easy items.

4. As for the vocational subject (2) of the Hospitality-major Category, unit subjects were fewer, students became more proficient, item counts on specialty English decreased and important subject ideas and practical application were stressed. As a result, difficult items tended to decrease and items with an appropriate difficulty increased.

The results and suggestions provided by this research may help teachers and students of the technological and vocational senior high schools to enhance reading comprehension competence and diversified learning for students, to adapt to the current life and facing the challenges of core competence oriented exam items in the future and to serve as a reference for the following related researches by integrating the 108 Syllabus and the correlation between item difficulty and students' performance into teaching.

Keywords: Curriculum Guidelines of 12-year Basic Education, core competence, vocational senior high school, the 4-year TVE College Entrance Examination, item difficulty index.

INTRODUCTION

Core competence is based as the backbone of curriculum development to achieve the ideas and goals of the 12-year basic education and to profit the consistency among educational stages and integration of interdisciplinary subjects. The technological and vocational senior high schools (TVE schools for short) on the fifth learning stage of the 12-year basic education mainly provide general, special and practice courses to assist students in developing professional and practical skills, cultivating work ethics, improving cultural and technological capacities, developing creative thinking and adaptability to social changes, establishing a foundation for career development and enhancing employment capability of practical application (Ministry of Education, 2014).

The Testing Center for Technological and Vocational Education (hereinafter referred to as TCTE) has been engaged in the 4-year and 2-year TVE joint college entrance examinations (4-year TVE Joint Exam for short) for twenty groups (categories). The business and administration category and the hospitality-major category had the most candidates for the joint exams. The numbers of people that actually took the vocational subject (1) exam of the business and administration category for academic years 109-111 were 23,058, 21,750 and 19,574 respectively. The numbers of people that actually took the vocational subject (2) exam of the business and administration category for academic years 109-111 were 18,377, 17,611 and 16,026. The numbers of candidates that actually took the vocational subject (1) exam of the hospitality-major category for academic years 109-111 were 15,458, 13,234 and 11,224 respectively. The numbers of candidates that actually took the vocational subject (2) exam of the hospitality-major category for academic years 109-111 were 15,463, 13,218 and 11,205 separately (as shown in Table 1).

Table 1. Actual Candidates of Business & Administration Category and Hospitality-major Category for Academic Years 109-111

Category	Academic Year	109	110	111
Business and Administration Category subject (1)		23,058	21,750	19,574 (3,548 candidates from other study areas)
Business and Administration Category subject (2)		18,377	17,611	16,026
Hospitality-major Category subject (1)		15,458	13,234	11,224
Hospitality-major Category subject (2)		15,463	13,218	11,205

The 4-year TVE Joint Exam was drafted in compliance with the announced scopes of subjects to be tested from 108 Syllabus to test the unit subjects required to learn for examinees in each semester and academic year, to assess examinees' mastery of learning contents, and to help teachers get hold of the trend of item difficulty. An initial understanding can be made through the question items of the joint exam for an evaluation of the learning goals for each category and the trend of item difficulty.

LITERATURE REVIEW

I. Educational goals and core competence for each category

To cope with national construction, social industries, the attributes of vocational categories and career development of the students, TVE senior high schools provide six study areas, including industry, business, agriculture, home economics, marine technology and fishery, and art and design. The commerce and management group belongs to the study area of business and its applicable departments consist of business affairs, international trade, accounting affairs, data processing, electronic commerce, logistics and distribution management, produce marketing, navigation management, fishery management, and real estate management. The hospitality group belongs to the study area of home economics and its applicable departments consist of tourism industry and restaurant management (Ministry of Education, 2018). For the students of the commerce and management group of skill-based senior high schools that signed up for the 4-

year TVE Joint Exam, most of them were from the departments of data processing, business affairs, and international trade. As for students of the hospitality group of skill-based senior high schools that signed up for the 4-year TVE Joint Exam, most of them were from the departments of restaurant management, tourism industry, and restaurant skills.

The curriculum guidelines (commerce & management group and hospitality group) for skill-based senior high schools were implemented in academic year 108. The educational goals and core competencies of the groups are summarized as follows:

Educational goals of commerce & management and hospitality groups: to equip the students with core competencies, to establish a foundation of learning or further studying for students in related professional fields, and to develop occupational attitudes and ideas for talents with basic and professional backgrounds.

The core competencies of the commerce & management group are to develop the abilities of logical thinking, applying technological information, identifying semiotics, communicating, interacting and coordinating, problem solving at the workplace with empathy, business etiquette and communication and business innovation, knowledge and realization of occupational safety and health, professional issues of citizenship and social responsibilities in labor laws and regulations.

Besides the former section mentioned above, the core competencies of the hospitality group are to cultivate the abilities of hospitality English and communication, hospitality service preparation and operation, problem solving at the workplace with human care and empathy, knowledge and realization of occupational safety and health, exploring work ethic and environmentalism, developing personal potential, and investigating professional issues on citizenship and social responsibilities.

II. Exam subjects and credits for each category

For the examination subjects of the commerce & management group and the hospitality group in the 4-year TVE Joint Exam, only the names of the subjects in the new curriculum guidelines were amended and the content complied with the features of the curriculum guidelines (as shown in Table 2). For the commerce and management group, 46 credits were necessary for the required specialty and practice courses prescribed by the MOE in Syllabus 108; 48 credits were required for the hospitality group. For the commerce and management group of vocational senior high schools, 30 credits were necessary for the required specialty and practice courses prescribed by the MOE in Syllabus 99; 28 credits were required for the hospitality group (as shown in Table 3). As far as the commerce & management group and the hospitality group were concerned, 16-20 credits were additionally adjusted for the required specialty and practice courses prescribed by the MOE in accordance with Syllabus 108. In this way, the courses that combined industry with professional capabilities of core competence could be planned and student-based practicum might be developed as a feature of learning.

Table 2. Summary of Exam Subjects for Commerce & Management and Hospitality Groups

Group \ Subject	Exam Subjects Applicable to Syllabus 108	Exam Subjects Applicable to Syllabus 99	Remarks
Business and Administration Category subject (1)	Introduction to Business, Introduction to Digital Technology, Digital Technology Application	Introduction to Business, Computer Architecture	Computer Architecture was divided into Introduction to Digital Technology and Digital Technology Application.
Business and Administration Category subject (2)	Accounting, Economics	Accounting, Economics	--
Hospitality-major Category subject (1)	Introduction to Tourism & Hospitality Industry	Introduction to Hospitality	Subject name amended
Hospitality-major Category subject (2)	Food and Beverage Service Skills, Beverage Practice	Food and Beverage Service, Drinks and Bartending	Subject names amended

Table 3. Credits Required for Commerce & Management and Hospitality Groups

Subject Group	Specialty and Practice Courses Prescribed by the MOE in Accordance with Syllabus 108	Specialty and Practice Courses Prescribed by the MOE in Accordance with Syllabus 99
Business and Administration Category	46 credits	30 credits
Hospitality-major Category	48 credits	28 credits

III. Test analysis

The 4-year TVE Joint Exam has a high-risk testing characteristic, which indicates it is an examination that would impose great impact on individuals or a group since the test items of this exam determine whether the students could enter their ideal schools or not. Within the scope of current drafting, the material acquired by the learner during the learning stage and the prior knowledge required by TVE schools are measured. Reliability and validity are two important features to assess the usability of a test and decided by the item quality. The quality of items can be enhanced through item analysis, which can be divided into the qualitative analysis of the form and content and the quantitative analysis of item statistical characteristics. The item characteristic (difficulty index) and students' performance were described by reliability and difficulty as follows:

(I) Reliability

Reliability represents the stability of a test and item consistency. CronBach's α was used as the reliability of the 4-year TVE Joint Exam. In the formula, N is the number of items; S^2_i is the variance of each item scored; S^2 is the variance of the subject scored. See the following formula.

$$\alpha = \frac{N}{N-1} \left(1 - \frac{\sum S^2_i}{S^2} \right)$$

The reliability estimated by α is usually called as the minimum estimating reliability (Guo Sheng-yu, 1995) with the judgments as follows:

- A. a reliability coefficient of 0.8 above: a test with high reliability
- B. a reliability coefficient between 0.6 and 0.8: a test with acceptable reliability
- C. a reliability coefficient of 0.6 below: a test with low reliability and possible causes to be investigated

(II) Difficulty

The Classical Test Theory (CTT) was used to calculate the item difficulty of the 4-year TVE Joint Exam for the qualification rate. A greater value implied more candidates were qualified and items tended to be easy; in other words, it stood for the number correct ratio. P_i , the difficulty index, was the number correct ratio of each item; R_i was the number of testees that answered item i correctly and N was the number of total examinees. The formula is as follows:

$$P_i = \frac{R_i}{N}$$

The difficulty index ranged from 0.0 to 1.0 and was divided into three levels (as shown in Table 4).

- A. The item was judged 'difficult' with a difficulty index less than 40.
- B. The item was judged 'medium' with a difficulty index of 40 above and 70 below.
- C. The item was judged 'easy' with a difficulty index over 70.

Table 4 Chart of Difficulty Levels

Difficulty	Level
$P < 0.4$	Difficult
$0.4 \leq P < 0.7$	Medium
$0.7 \leq P$	Easy

ITEM RELIABILITY AND DIFFICULTY ANALYSIS

The data of the qualitative analysis and the quantitative analysis promulgated by TCTE were applied in this research. The 4-year TVE Joint Exam complied with the drafting principles of the test theories and maintained the quality of items since the scopes of the subjects announced to be tested were based and the common professional and practice subjects specified by MOE were complied for evaluation. The reliability and difficulty were explained as the following.

(I) Reliability

The Classical Test Theory (CTT) was used to calculate the item difficulty of the 4-year TVE Joint Exam for the qualification rate. A greater value implied more candidates were qualified and items tended to be easy; in other words. The reliability was CronBach's α . For the professional subject (1) of the commerce and management group in academic years 109 thru 111, the reliability index was 0.89, 0.87 and 0.84 respectively and that for the professional subject (2) was 0.90, 0.91 and 0.92 separately. For the professional subject (1) of the hospitality group in academic years 109 thru 111, the reliability index was 0.89, 0.89 and 0.84 and that for the professional subject (2) was 0.90, 0.86 and 0.92. These indexes showed that the test reliability of these two groups that took part in the 4-year TVE Joint Exam for academic years 109 thru 111 was high; in other words, the exam had stability and item consistency.

(II) average score

A. Business and Administration Category

The average score of all candidates for the professional subject (1) of the commerce and management group in academic years 109 thru 111 was 63.76, 67.00 and 49.68 respectively (as shown in Table 5 and Figure 1) and that for the professional subject (2) was 45.21, 41.39 and 47.18 (shown in Table 5 and Figure 2). The number of candidates decreased sharply due to sub-replacement fertility; courses were given from the classroom to online because of the pandemic. Whether such factors affected the candidates was to be investigated. As Syllabus 108 was first implemented in academic year 111, the professional subject (1) of the commerce and management group was different from the previous one in the old course guidelines. In addition, students from the foreign language group also participated in the exam. Consequently, practical integration, application and determination across the chapters were combined for item patterns, causing a great decline in the average score. However, the units in the professional subject (2) of the commerce and management group were differentiated from the courses taken in colleges and senior high schools specifically, leading to a more stable average score as well as item difficulty.

Table 5 Average Scores of the Commerce & Management Group for Academic Years 109 thru 111

Group	Academic Year		
	109	110	111
Business and Administration Category subject (1)	63.76	67.00	49.68
Business and Administration Category subject (2)	45.21	41.39	47.18

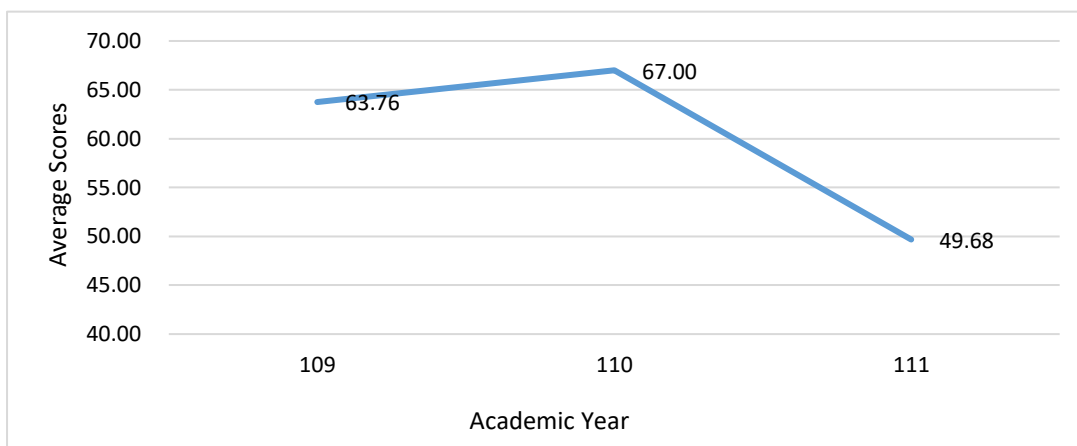


Figure 1 Line Graph of Average Scores of Professional Subject (1) of the Commerce & Management Group for Academic Years 109 thru 111

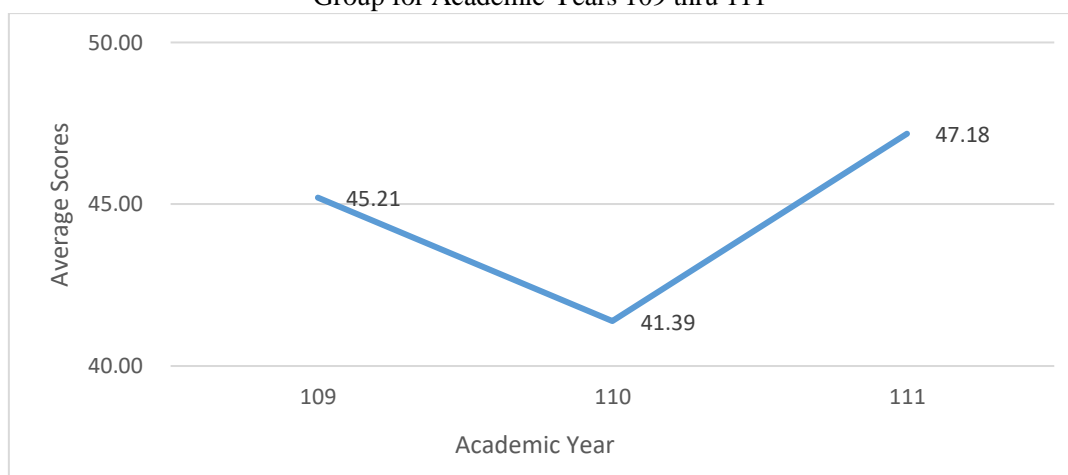


Figure 2 Line Graph of Average Scores of Professional Subject (2) of the Commerce & Management Group for Academic Years 109 thru 111

B. Hospitality-major Category

The average score of all candidates for the professional subject (1) of the hospitality group in academic years 109 thru 111 was 48.64, 60.79 and 45.43 respectively (as shown in Table 6 and Figure 3) and that for the professional subject (2) was 43.68, 45.16 and 45.15 (shown in Table 6 and Figure 4). The number of candidates decreased sharply due to sub-replacement fertility; courses were given from the classroom to online because of the pandemic. Whether such factors affected the candidates was to be investigated. As Syllabus 108 was first implemented in academic year 111, the professional subject (1) of the hospitality group was different from the previous one in the old course guidelines. Item patterns became variable to test students' mastery of knowledge. Besides, practical integration, application and determination across the chapters were combined for item patterns, causing a great decline in the average score. However, the units in the professional subject (2) of the hospitality group became more specific and drafting was balanced, leading to a more stable average score as well as item difficulty.

Table 6 Average Scores of the Hospitality Group for Academic Years 109 thru 111

Academic Year	109	110	111
Group			
Hospitality-major Category subject (1)	48.64	60.79	45.43
Hospitality-major Category subject (2)	43.68	45.16	45.15

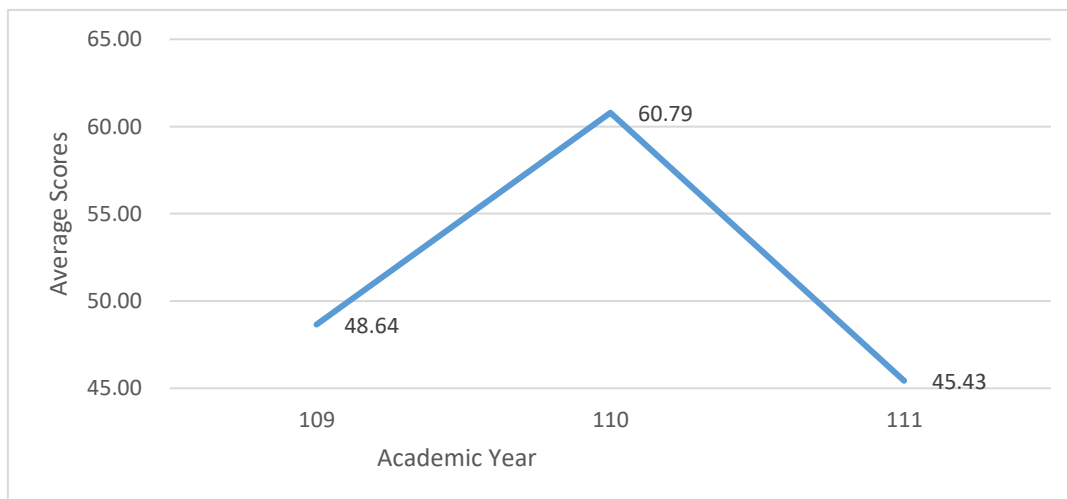


Figure 3 Line Graph of Average Scores of Professional Subject (1) of the Hospitality Group for Academic Years 109 thru 111

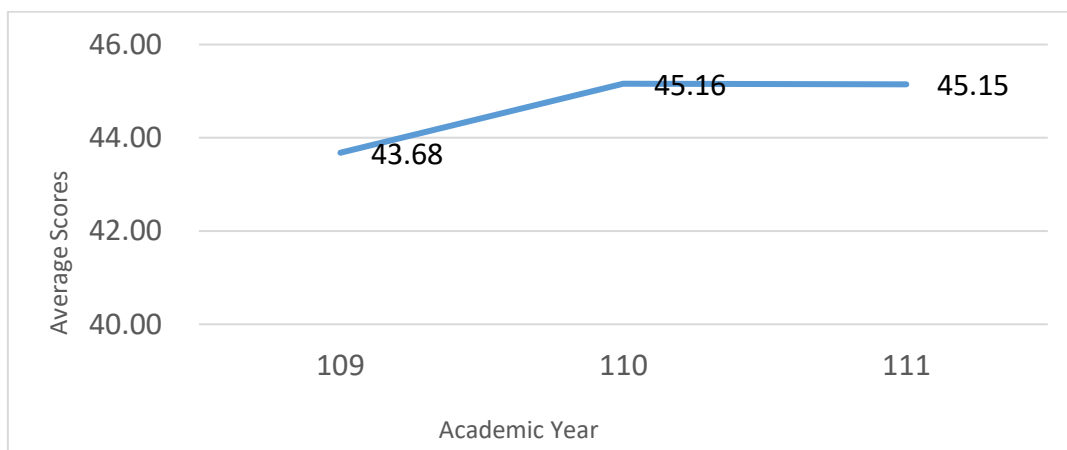


Figure 4 Line Graph of Average Scores of Professional Subject (2) of the Hospitality Group for Academic Years 109 thru 111

(III) item characteristic (difficulty index)

A. professional subject (1) of the commerce and management group (as shown in Table 7 and Figure 5)

For the professional subject (1) of the commerce and management group, the number of difficult items increased from 6 to 17 for academic years 109 and 110. Not many changes were made for the items with a moderate difficulty. The numbers of easy items were 19 in academic year 109, 23 in academic year 110 and 10 in academic year 111. As the total number of items was 50, it revealed that difficult items increased and easy items decreased, which implied the items of the professional subject (1) tended to be difficult. Possible reasons might be an increase in the credits of the vocational practice subject required by Syllabus 108, an increase in battery, diverse cross-unit themes, more difficult practical item patterns, unfamiliar with incorporating life situation to basic competence or marketing mix, and the ability of applying economic knowledge thinking to deal with issues like trade, GDP and economic ideas. Nevertheless, the number of items with a medium difficulty was still maintained.

Table 7 Difficulty Distribution Chart of Professional Subject (1) of the Commerce and Management Group for Academic Years 109 thru 111

No.) Academic Year	Difficulty % (Item	Difficult (Item No.) Index < 0.4	Medium (Item No.) 0.4 ≤ Index < 0.7	Easy (Item No.) 0.7 ≤ Index
	No.)			
111		34%(17)	46%(23)	20%(10)
110		12%(6)	42%(21)	46%(23)
109		12%(6)	50%(25)	38%(19)

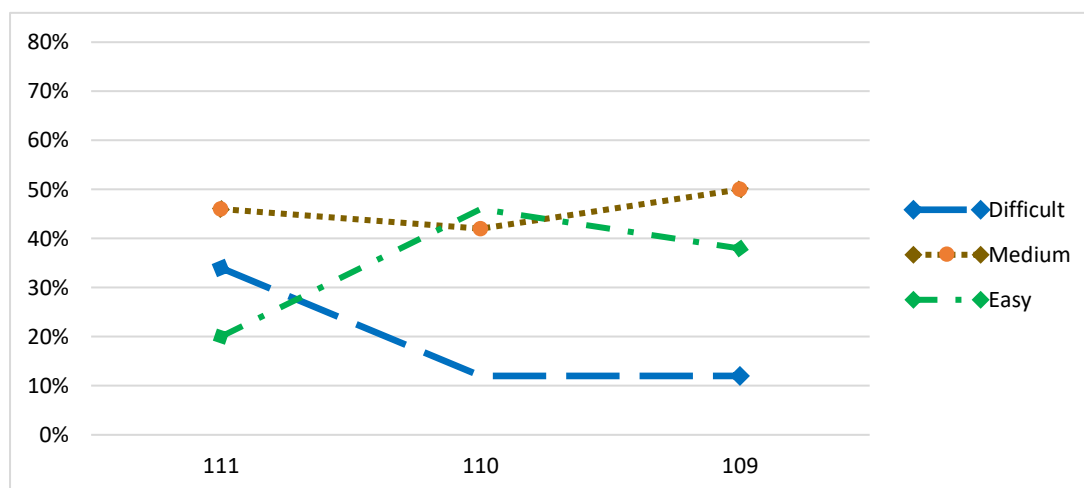


Figure 5 Difficulty Distribution Graph of Professional Subject (1) of the Commerce and Management Group for Academic Years 109 thru 111

B. professional subject (2) of the commerce and management group (as shown in Table 8 and Figure 6)

As for the professional subject (2) of the commerce and management group, the numbers of difficult items were 16 in academic year 109, 17 in academic year 110 and 14 in academic year 111. Not many changes were made for the items with a moderate and easy difficulty. It showed that the numbers of difficult and medium items were steady and the overall average score increased 6 points. Possible reasons might be that the unit subjects of accounting were more specific, units required for the skill-based senior high school students were clearly divided, part of the courses in the previous guidelines was separated for colleges, students mastered learning content more easily, content and expression in the financial statements were improved, expression of expected credit loss / gain in the income statement was enhanced, and monetary and financial ideas like allowance for loss changes derived from actual or estimated loss were integrated and applied.

Table 8 Difficulty Distribution Chart of Professional Subject (2) of the Commerce and Management Group for Academic Years 109 thru 111

No.) Academic Year	Difficulty % (Item	Difficult (Item No.) Index < 0.4	Medium (Item No.) 0.4 ≤ Index < 0.7	Easy (Item No.) 0.7 ≤ Index
	No.)			
111		28%(14)	66%(33)	6%(3)
110		34%(17)	64%(32)	2%(1)
109		32%(16)	68%(34)	0%(0)

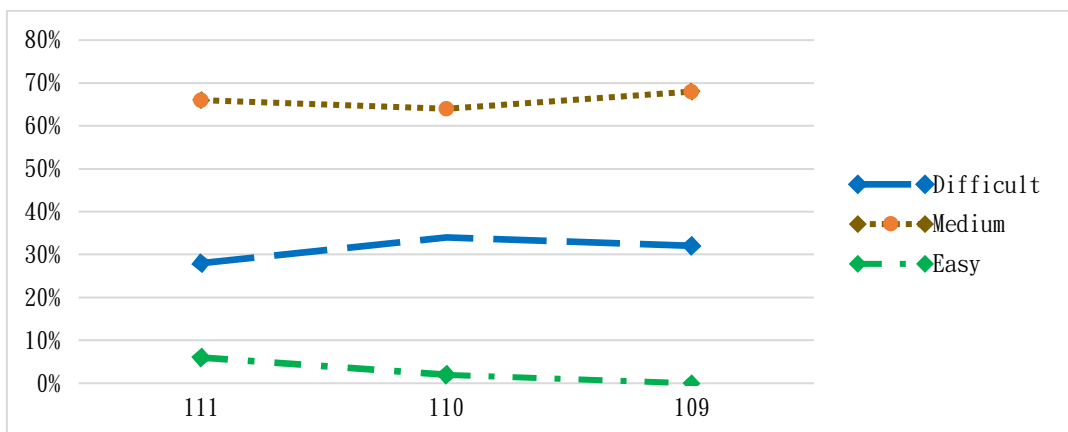


Figure 6 Difficulty Distribution Graph of Professional Subject (2) of the Commerce and Management Group for Academic Years 109 thru 111

C. professional subject (1) of the hospitality group (shown in Table 9 and Figure 7)

As far as the professional subject (1) of the hospitality group was concerned, the numbers of difficult items were 6 in academic year 109, 7 in academic year 110 and 25 in academic year 111. Items with a moderate difficulty decreased 4 from academic years 109 thru 111; whereas, the numbers of easy items were 8 in academic year 109, 20 in academic year 110 and 6 in academic year 111. As the total number of items was 50, it revealed that difficult items increased and easy items decreased, which implied the items of the professional subject (1) tended to be difficult. Possible reasons might be an increase in the credits of the vocational practice subject required by Syllabus 108, an increase in battery that incorporated tourist situations, diverse cross-unit themes, more difficult practical item patterns, unfamiliar with eight major regional cuisines, the arrival procedure and the geography of the tourist industry. Nevertheless, the number of items with a medium difficulty was still maintained.

Table 9 Difficulty Distribution Chart of Professional Subject (1) of the Hospitality Group for Academic Years 109 thru 111

Academic Year	Difficulty % (Item No.)		
	Difficult (Item No.) Index < 0.4	Medium (Item No.) 0.4 ≤ Index < 0.7	Easy (Item No.) 0.7 ≤ Index
111	50% (25)	38% (19)	12% (6)
110	14% (7)	46% (23)	40% (20)
109	38% (19)	46% (23)	16% (8)

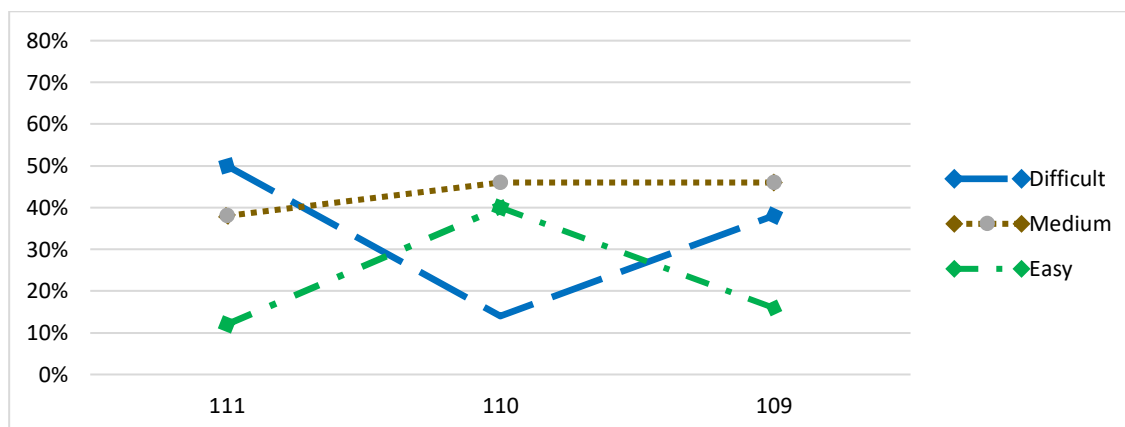


Figure 7 Difficulty Distribution Graph of Professional Subject (1) of the Hospitality Group for Academic Years 109 thru 111

D. professional subject (2) of the hospitality group (as shown in Table 10 and Figure 8)

For the professional subject (2) of the hospitality group, the numbers of difficult items were 22 in academic year 109, 25 in academic year 110 and 22 in academic year 111. 26 items were moderately difficult in academic year 109, 19 in academic year 110 and 27 in academic year 111; whereas, the numbers of easy items were 2 in academic year 109, 6 in academic year 110 and 2 in academic year 111. As 3 additional difficult items appeared in academic year 110 and there were more easy items, it was known that the number of difficult items for the vocational subject (2) maintained stable and the number of items with a moderate difficulty increased. Therefore, students' knowledge on professional hospitality English, ordering at a restaurant, room service, practical bartending situations and wine recipe needed to be enhanced.

Table 10 Difficulty Distribution Chart of Professional Subject (2) of the Hospitality Group for Academic Years 109 thru 111

Difficulty % (Item No.) Academic Year	Difficult (Item No.) Index < 0.4	Medium (Item No.) 0.4 ≤ Index < 0.7	Easy (Item No.) 0.7 ≤ Index
111	44%(22)	54%(27)	2%(1)
110	50%(25)	38%(19)	12%(6)
109	44%(22)	52%(26)	4%(2)

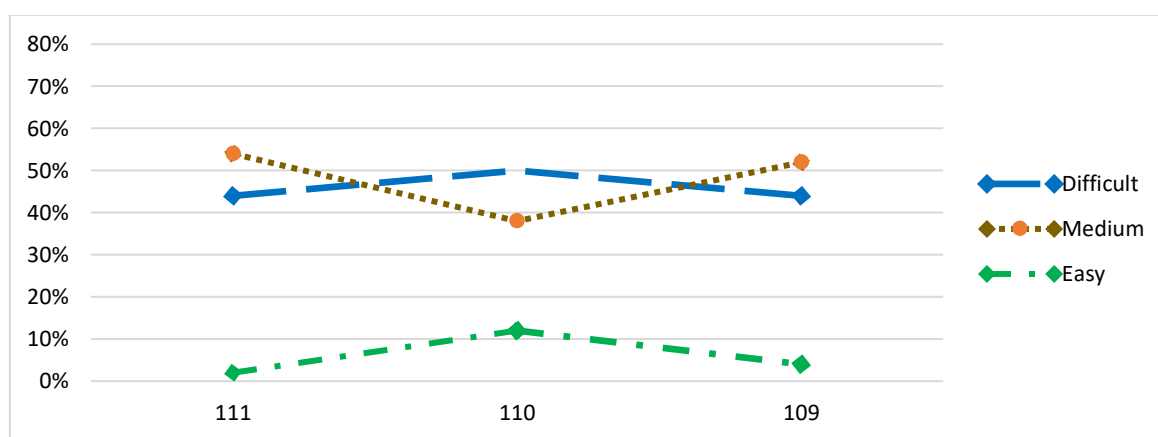


Figure 8 Difficulty Distribution Graph of Professional Subject (2) of the Hospitality Group for Academic Years 109 thru 111

CONCLUSION AND SUGGESTION

I. Conclusion

Qualitative and quantitative analyses of item difficulty orientation and testees' performance from the commerce and management group and the hospitality group in academic years 109 thru 111 were conducted in this research. Preliminary observation and interpretation were presented as follows:

(I) reliability: CronBach's α of the exam items for the commerce and management group and the hospitality group in academic years 109 thru 111 was higher than 0.8; i.e. the exam had stability and item consistency

(II) average score: the average score of all candidates for the professional subject (1) of the commerce and management group and that of the hospitality group in academic year 111 was 49.68 and 45.43 respectively, which was significantly lower than that in previous two academic years. A probable cause might be the implementation of Syllabus 108 since candidates needed to work more on the learning content of new unit subjects and practical integration and application across the chapters for comprehension. The units in the professional subject (2) of the commerce and management group and that of the hospitality group were differentiated specifically with an appropriate drafting proportion, leading to a more stable average score as well as item difficulty.

(III) item characteristic (difficulty index): the test items of the professional subject (1) for the commerce and management group in academic year 111 tended to be difficult; however, the number of items with a moderate

Analysis of Item Difficulty Orientation and Testees' Performance for the TVE Joint College Entrance Examination difficulty was maintained. The number of difficult items of the professional subject (2) for the commerce and management group in academic year 111 was kept stable. The test items of the professional subject (1) for the hospitality group in academic year 111 tended to be difficult; however, the number of items with a moderate difficulty was maintained. The number of difficult items of the professional subject (2) for the hospitality group in academic year 111 was kept steady with an increase in medium items.

(IV) recommendations for item qualitative analysis:

A. For the test items of the professional subject (1) of the commerce and management group in academic year 111, possible reasons might be an increase in the credits of the vocational practice subject required by Syllabus 108, an increase in battery, diverse cross-unit themes, more difficult practical item patterns, unfamiliar with incorporating life situation to basic competence or marketing mix, and the ability of applying economic knowledge thinking to deal with issues like trade, GDP and economic ideas.

B. For the test items of the professional subject (2) of the commerce and management group in academic year 111, possible reasons might be that the unit subjects of Syllabus 108 were more specific, learning content on each stage was effectively divided, content and expression in the financial statements were improved, expression of expected credit loss / gain in the income statement was enhanced, and monetary and financial ideas like allowance for loss changes derived from actual or estimated loss were integrated and applied.

C. As for the test items of the professional subject (1) of the hospitality group in academic year 111, possible reasons might be an increase in the credits of the vocational practice subject required by Syllabus 108, an increase in battery that incorporated tourist situations, diverse cross-unit themes, more difficult practical item patterns, unfamiliar with eight major regional cuisines, the arrival procedure and the geography of the tourist industry.

D. As far as the test items of the professional subject (2) of the hospitality group in academic year 111 were concerned, students' knowledge on professional hospitality English, ordering at a restaurant, room service, practical bartending situations and wine recipe needed to be enhanced.

II. Suggestion

The results of this research can help candidates and instructors when confronting the test items of the 4-year TVE Joint Exam. Factors like the vocational fields specified in the course guidelines, practice orientation and diversified competencies need to be considered. Students should develop the ability of integrating the lessons they have learned and applying them to real life. Students' capabilities of integration, exploratory thinking, practical operation and application can be evaluated through assessments. Based on the qualitative and quantitative analyses results provided by TCTE, item characteristic orientation (i.e. item difficulty index) and testees' performance were estimated in this research so that students may apply what they have learned at school and understand their specialties that are practice directed, integrated abilities and exploratory thinking. Students' learning difficulties and application of teaching strategies can be handled through transfer of learning. The author suggests the candidates should still master the basic knowledge in the book, make good use of reading skills, develop patience with reading, focus on practical operation and application and enhance thinking capabilities. Meanwhile, the testing center needs to keep improving and maintaining the stability of item quality as well as clear and specific presentation of items. Related suggestions may serve as a reference for future studies.

REFERENCES

余民寧（2013）。**教育測驗與評量：成就測驗與教學評量第三版**。新北：心理。

技專校院入學測驗中心（2021）。**108課綱命題精進**。2021年10月1日，取自
<https://www.tcte.edu.tw/download/111/>。

技專校院入學測驗中心（2022）。**各年度四技二專統一入學測驗群(類)別報考人數統計**。2022年9月1日，取自：<https://www.tcte.edu.tw/four/majtype111.php>

技專校院入學測驗中心（2022）。**統測施測相關數據**。2022年9月1日，取自：
https://www.tcte.edu.tw/download/opendata/index_stat.php

技專校院入學測驗中心（2022）。**測驗業務簡章**。2022年9月1日，取自：

<https://www.tcte.edu.tw/exam4.php>

教育部（2018）。十二年國民基本教育課程綱要。2022年9月28日，取自
<https://www.naer.edu.tw/PageSyllabus?fid=52>.

技專校院入學測驗中心（2022）。111學年度統一入學測驗-試題研討會簡報檔。2022年10月28日，
取自：<https://www.tcte.edu.tw/download/opendata/>