Correlation of English Test Outcome From TVE Joint College Entrance Examination of Taiwan VS. Professional English Reading Speed and Comprehension

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Abstract: Educators throughout history have tried to evaluate the different aspects of learning performances. Notice the importance of learning for understanding and time spend studying, this research explores the correlation based on performance outcome from English examination of the English as foreign language (EFL) participants to professional English reading performances on reading speed and reading comprehension, using eye chasing device for observation. 15 student volunteers with technical background participated with experiment. SPSS 21 was used for descriptive and Pearson correlation statistics, with both hypotheses accepted on positive correlation among the English testing outcomes of technical background participants, who have recently completed their Technological and Vocational Education Joint College Entrance Examination of Taiwan 2014, and professional English reading speed and comprehension. Realizing that prior knowledge helps with reading, the authors recommend the use of intensive reading practices of both contextual and graphical images while training the EFL learners. Once they build up solid foundation of broader knowledge, they will be able to read faster and comprehend better.

Keywords: English subject testing outcome (from Technological and Vocational Education Joint College Entrance Examination of Taiwan, TVE JCEET), reading speed (RS), reading comprehension (RC), eye chasing device (ECD), professional English reading (PER)

1. Introduction

1.1 Purpose and Objective

Educators throughout history have tried to evaluate the different aspects of learning performances (Alexander, 2000). Knowing the importance of learning for understanding and time spend studying, this research explores how testing outcome of the participants of English test of Technological and Vocational Education Joint College Entrance Examination of Taiwan (TVE JCEET), from vocational and technical high school, correlate with professional English reading performances on reading speed and reading comprehension, using the eye chasing device for observation. This research aims at finding possible answers on both technical and vocational students' visual reading formation. The research also attempts to offer suggestion on the way to improve EFL students' visual learning with education. To serve these purposes, the authors have come up with the following objectives:

1. To explore the differences of English subject testing outcome (from Technological and Vocational Education Joint College Entrance Examination of Taiwan) and professional English reading speed among technological and vocational students.
2. To detect the relationship between English subject testing outcome (from Technological and Vocational Education Joint College Entrance Examination of Taiwan) and reading comprehension among technological and vocational students.

2. Literature Review

2.1 Background on Reading Comprehension

A growing number of eye chasing tests have yielded a handful of findings relevant to reading experiences (Biedert, Buscher, & Dengel, 2010; Lowell & Morris, 2014; Mayer, 2010). Nevertheless, using eye chasing application to identify the implication between English testing outcome of TVE JCEET, and professional English contents' reading speed and reading comprehension have not been examined. Hence, the authors attempt to fill the gap.

Paivio (1990)'s dual coding theory helps on explaining the reading comprehension through text-diagram representations. The theory describes that the text and diagram representations are deposited in various cognitive systems due to variety of physical formats (Clark & Clark, 2010; Ho, Tsai, Wang, & Tsai, 2014; Paivio, 1990). Therefore, a combination of scanning or reading diagram and text both could be intensely used to synthesize and enhance cognitive information processing for comprehension than using text or diagram alone (Clark & Clark, 2010). The combinations are important because the information are imperative knowledge for speed of processing and understanding and they can also be expanded for broad range of advanced learning, convert into skills for processing and application, and as outcomes of performance output (Lin, 2011; Orquin & Mueller Loose, 2013). It is stated that the longer the duration time was, based on former research experimental results, the greater the amount of attention that was allocated and accessed (de Koning, Tabbers, Rikers, & Paas, 2010; Ho et al., 2014).

The more the readers know about the subject, the easier the reading understandings the reader gains. The authors therefore perceive that familiarity with professional English subject contents may also reflects on the timing of reading and gazing at professional English articles. Efficient readers trigger their prior knowledge for reflecting on their schemata, predicting the layouts and outcomes, generalizing and actively reading for answers, as these characteristics enhance understanding and speed (Anderson, 1994; Fitzgerald, 1995; Goodman & Goodman, 1978; Peregoy & Boyle, 2000), even when they pursuit professional English reading. This quality is due associated with the factors that knowledge is able to be generalized, conceptualized, and theorized to encompass various scopes, transferred to multiple applicability, and enhanced for creativity (Lin, 2011). Base on previous findings, the authors have identified that with the longer duration of reading time, the greater the attention spent on professional English reading, while the reading speed may expand, the reading comprehension may intensely extend.

2.2 Eye Chasing Studies and Reading Speed

In 1993, Hegarty and Just conducted a research study by using reading with help of visual chasing framework. In this research, they have revealed that participants of technical background regardless of their high and low mechanical abilities in their reading behaviors tended to read some clauses or sentences before viewing diagram to construct relationship. Readers' prior knowledge of subjects and strategies of reading cognitively and psychologically can help efficient readers to associate, inference, and form speed and recognition of professional reading contents and materials (Ehrlich & Johnson-Laird, 1982; Glenberg & Langston, 1992; Hegarty & Just, 1993; Just & Carpenter, 1987). Mayer (2003) on the other hand, described that "learners' cognitive integration process involves selecting appropriate aspects of words or images, building coherent visual and verbal mental models from each representation, and finally incorporating both mental models based on learners' prior knowledge to generate learning" (Mayer, 2003). As in conjunction to Myer's study, the later experiments conducted also indicates that, as revealed by heat map of eye chasing device, visual distribution of participants tend to spend more time reading the textual than the graphical records. Participants of high prior knowledge (high PK) showed longer fixation durations than low prior knowledge (low PK) participants. The high PK participants revealed more inter-scanning transitions than low PK participants between words and pictures, but diagrams as well. Therefore, it has been learned that high PK participants are more capable of integrating text and graphic information (Ho et al., 2014). With certain subjects being more intensive and complex, i.e. specialty and expert contents, than

general readings, with the latter being more frequently studied, the authors thus focus on the lesser known of professional English reading. Syndicating and generalizing the findings from previous studies, the authors recognize that prior knowledge will help with reading comprehension and forming generalization of understanding to other lesser familiar professional readings, as aforementioned factors, including but not limited to prior knowledge concept may enhance understanding, could also be features influencing professional English reading speed and comprehension of this research's participants.

2.3 Technological and Vocational Education Joint College Entrance Examination of Taiwan

The Technological and Vocational Education (TVE) system is important to nurture human resources in Taiwan. Under the commission of Taiwan Ministry of Education (MOE), the nationwide TVE Joint College Entrance Examination, of various professional fields, including English subject as one of the mandatory tests, has been used for technological and vocational colleges and universities throughout Taiwan (TCTVET, 2014). Therefore, this test is a well-respected and legitimate exam. The outcomes and associated references from TVE JCEET consequently provide the relevance for this research goal.

2.4 Research Questions

To accomplish the purpose of this study, the following two questions were proposed.

1. What is the relationship between English examination outcomes from TVE JCEET, for people of English as foreign language (EFL), with technical background (TB), to professional English reading speed?
2. What is the relationship between English examination outcomes from TVE JCEET, for people of English as foreign language (EFL), with technical background (TB), to professional English reading comprehension?

2.5 Hypothesis

Based on the questions proposed, this research intends to test the following hypotheses:

1. There is a positive correlation between the participants of technical background, earning a high English testing outcome from Technological and Vocational Education Joint College Entrance Examination of Taiwan (TVE JCEET), to be able to read professional English articles faster than those with a lower score, In words, despite of reading familiar or unfamiliar professional English subject, participants with technical background, those who have received high scores on the English examination of TVE JCEET are able to read fast, those with lower score are reading slowly.
2. There is a positive correlation between the participants of technical background, earning a high English testing outcome from Technological and Vocational Education Joint College Entrance Examination of Taiwan (TVE JCEET), to have positive professional English reading comprehension. In other words, despite of reading familiar or unfamiliar professional English subject, participants with both technical and vocational background, are able to achieve positive outcome because they have done well in English of TVE JCEET.

3. Methodology

3.1 Research Framework and Process

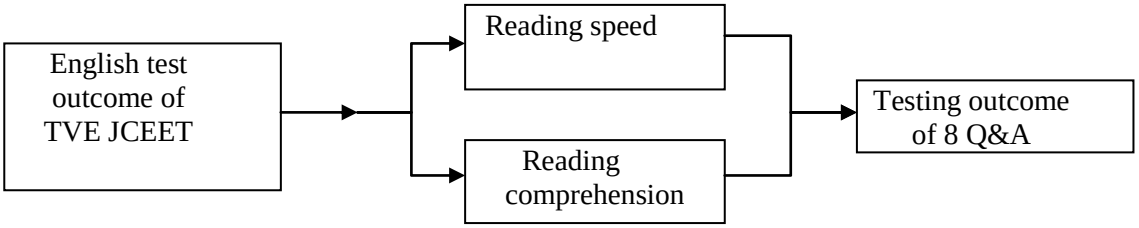

Figure 1. Eye Chasing Device Was Used for Professional English Reading Eye Movement.

3.2 Material

To conduct this research experiment: the authors have come up with 8 professional English reading articles similar to Taiwan college entry level of English proficiency, with 2 from computer engineering subject, 2 from mechanics subject, 2 from bio-medic subject, and 2 from business fields, along with 8 multiple choice questionnaires, one for each of the 8 articles, preinstalled them into laptop, for participants to read on screen display and respond through mouse clicks, to test participants' reading comprehension and speed, without participants' knowledge of contents in advance. To observe eye movements while reading, eye chasing device, head stabilizer, laptop computer were used. All participants read and answered all 8 assigned professional English readings and questionnaires, both.

3.3 Participant

To examine the English reading proficiency of those technical background participants, 15 students from the Na Fu Vocational and Technical High School of Taiwan, who completed their Technological and Vocational Education Joint College Entrance Examination of Taiwan (TVE JCEET) in 2014, was invited to the pilot test. It is with the help of eye chasing device that the eye movements, such as, region of interest (ROI) and total contact time (TCT) by participants, are made available for analysis.

3.4 Design and Procedure

Participants are told to read 8 English professional articles and answer 8 questions after finish reading each one of the 8 articles. Participants were then put to test at this experiment. One National Taiwan Normal University (NTNU) Professor and 5 National Taiwan Normal University (NTNU) research assistants proctored the experiment at Na Hu High School. 4 sets of same eye chasing devices were mounted, for prompt testing, to observe the eye movement of participants when they read and answered the questions.

3.6 Instruments

Four recently made of same EyeNTNU-180 eye chasers created by National Taiwan Normal University Electronic Department team, and sponsored by the Taiwan' Ministry of Education and the Ministry of Science and Technology, were used to monitor and record eye movements of 15 participants while reading professional English articles and responding to questionnaires and answers Q&A. Each of EyeNTNU-180 set includes a laptop computer in front of a camera to record eye movements. The laptop presented professional English articles and questionnaires. In this experiment, a sampling rate is 180Hz. To avoid errors in eye chasing measurement caused by shaking of head and

inconsistency of eye movement, a head stabilizer was used to fix head position. The distance between the screen and participants were set to 60cm straight apart. The normal time duration of a fixation of this experiment was set to 80 milliseconds.

3.7 Data Collection

The recently produced EyeNTNU-180 eye chasing device was adopted to monitor eye movements, to assess time of professional English reading, and to site coordination. By identifying the parameters and ROI (Region of Interest), the authors were able to determine the reading speed and possible comprehension, when measured against the testing outcomes from TVE JCEET English subject and the 8 Questionnaires and Answers after reading the arranged professional English articles. The authors had designed a computer program to examine the data of inspected components. The ROIs were categorized by ROI-splitter software and eye movement analyzer to evaluate eye movement data to generate scan paths, total gazing time, and eye contacts. Data are presented as following:

Participant	TVE JCEET of English test outcome	RC
1	78	6
2	72	4
3	70	4
4	68	4
5	56	4
6	52	4
7	48	3
8	48	3
9	48	3
10	46	3
11	44	2
12	44	2
13	42	2
14	42	1
15	42	1

Figure 1. The outcome of English subject TVE JCEET scores, for each one of the 15 participants, and the amount of Q&A answered correctly out of 8 English professional readings, identified as reading comprehension (RC).

Professional English Reading Subject	Average Words per Minute (WPM)	Standard Deviation
Mechanical	3777.5214	10741.04128
Electrical engineering	1635.2505	1624.66644
Bio-Medic	2368.9379	3272.17114
Business	1143.5126	753.10136

Figure 2. Descriptive statistic of average words per minute (WPM), and Standard deviation, read by all 15 participants together for each one of the 4 professional English subjects, by combining the outcomes of 2 questions per subject together into four aforementioned professional subjects. Based on the experiment, it is noticed that technical background participants tend to read Mechanical field at 3777.5214 WPM, more than Business subject of 1143.5126. To account for the individual participant's WPM, the authors took total number of words in the article / (tct/(1000x60)), tct stands for total

eye gazing time used.

	TVE JCEET	Professional English Reading Comprehension	Mechanical	Electrical Engineering	Bio-Medic	Business
Pearson correlation	1	.865**	.377	-.105	-.340	-.372

Explain: ** p<0.001 ; * p<0.01 , N=15

Figure 3. Two tails Pearson correlation between the 4 professional English readings and TVE JCEET English testing outcome.

4. Results and Discussions

4.1 TVE JCEET English and Professional English Reading tests' outcomes, Statistic Report

Figure 1 shows the outcome of English subject TVE JCEET scores, for each one of the 15 participants, and the number of Q&As answered correctly out of the 8 English professional readings from this correlation experiment, identified as reading comprehension RC. The authors hypothesized that participants of technical background who has received higher TVE JCEET English scores would tend to comprehend better when they attend to professional English reading, taking their exam outcomes as indictors. This hypothesis is reflected in Figure 1 with higher TVE JCEET earners getting higher RC scores. Figure 2 is the descriptive statistic, (by combining the results of two questions per subjects together and blending them into 4 professional English categories) which shows the average words per minute (WPM), and the standard deviations, read by all 15 participants together for each one of the 4 subjects examined. Participants of technical background on average tend to read more WPM on Mechanical, followed by Bio-Medic, then Computer Engineering, and finally Business professional subjects. To account for the individual participant's WPM, the authors took total number of words in the article / (tct/(1000x60)), tct stands for total eye gazing time used.

Figure 3, indicates that the two tails Pearson correlation table shows significant relationship between TVE JCEET English testing outcome and RC, number of questions answered correctly after reading the 8 professional English articles, but specific subjects. The examination outcomes strengthen the explanation that testing outcome and comprehension have positive correlation as stated in hypothesis 2, regardless of professional subjects read. The descriptive statistics on standard deviation and average TVE JCEET English test outcomes, and professional English reading Q&As answered correctly by the 15 pilot test participants are listed in Figure. 4. From this experiment, the authors have identified that TVE JCEET English testing outcome has positive relationships on reading speed, and professional English reading comprehension.

Professional English reading subject	Average	Standard Deviation	N
TVE JCEET English test outcome	53.33	12.414	15
Professional English reading comprehension	3.07	1.335	15

Figure 4. Descriptive Statistic of standard deviation and average TVE JCEET English test outcomes and professional English reading Q&As answered correctly.

5. Conclusion

Performance is an important output for educational results that educators have strived to assess and invent different features of learning practices. Knowing the importance of learning for comprehension and the amount of time spend studying, this research intends to explore how testing

outputs of the participants of English subject of Technological and Vocational Education Joint College Entrance Examination of Taiwan (TVE JCEET), from vocational and technical high school, link with professional English reading performances on reading speed and reading comprehension, using eye chasing device for surveillance. With Paivio (1990) dual coding theory and its supporters advocate on the benefits of reading comprehension, through both text-diagram representations, the authors combined literature review and this research experiment corresponded that reading of textual or graphical images alone would not be as effective in terms of speed and comprehension as scanning through both together. While knowledge and information processing are able to be transferred, synthesized, and created to encompass broader scopes of outputs (Ho, 2014; Lin, 2011), and with the results of this experiment, the authors therefore accept the two hypotheses proposed, because they have showed positive correlations on English subject testing outcome of TVE JCEET to professional English reading speed and comprehension.

The more and in-depth of the existing knowledge and training, the faster the one is able to read for comprehension, as the same applies for professional English subjects of familiar and unfamiliar field for those of English as foreign language practitioners. The authors would recommend of intensive reading practices of contextual and graphical images while training the EFL learners. Once they build up the solid foundation of broader knowledge, they will be able to read faster and know better.

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