The Relationship between English Language Proficiency and Logical Thinking Skills

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ABSTRACT

The present study investigates the relationship between students' English language proficiency and their logical reasoning reflected by their performance in applying spreadsheet program. Since logical thinking is the basis of both using English language for communication and operating Microsoft Excel program, students can very likely show similar success in their performance while learning these two skills. The subjects were 67 students enrolled at a secretarial college in Surabaya, Indonesia. Data were collected from the students' scores of TOEIC international test and Computer II course focusing on Microsoft Excel. Means of the scores were calculated and the sets of data were analyzed to see if there was a significant correlation between them. The results showed that the students' English proficiency correlated significantly with their academic performance in computer. It can then be concluded that students with better logical thinking ability seem to be more successful in learning English as a foreign language.

Keywords: English language proficiency; logical thinking skills; TOEIC, Microsoft Excel

INTRODUCTION

English proficiency and computer skills are critical competencies for any business professionals. They are important tools which enable one to communicate with other people and to process jobs by making use of technology. As a matter of fact, both English language skills and computer skills require logical thinking. Logical reasoning will enable someone to learn and master them more easily, and also enable someone to perform better in those skills.

Language and thinking intricately intertwine, so language can be described as a tool of thought as well as a tool of communication. As such, language determines the way people think; on the other hand, the way people use language for communicating their ideas reflects the way they think. One way people use language in communication is to reason. To communicate convincingly people need to apply reasoning soundly. It is primarily with this use of language that logic is concerned. It is interesting then to find out how logical thinking relates to the success of learning and using a foreign language.

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Logical thinking is also the basis in operating computer using spreadsheet. All the operating functions of Microsoft Excel, for example, are based on logic. Accordingly, students who are good at logical thinking may learn operating the Excel functions more easily. They should be more successful in the Computer course in learning Microsoft Excel.

For the above mentioned reasons, it is interesting to find out whether these two kinds of skills, English language skills and computer skills reflecting logical thinking, are also related during the process of learning, especially in a higher education like a secretarial college where both skills are the major skills required of the profession. The present study aims at investigating whether there is a significant correlation between students' English proficiency as shown by their TOEIC scores and their academic performance in computer as shown by their achievement of Computer II course.

LITERATURE REVIEW

As human beings are growing up, they go through phases of development in both thinking and language. In many instances, people have a substantial amount of their thinking by involving the use of language. That is why language is regarded as a tool of thought and equally of knowledge and understanding.

LANGUAGE, THOUGHT AND LOGIC

It is generally accepted that there is a close relationship between language and thought. Although this does not imply that thought is impossible in the absence of language, language is still considered the most efficient and best-developed means of conveying thought (Blackburn, 2017). People communicate, work and play all by means of language to understand and to be understood. On the contrary, it has to be admitted that thought is indispensable to using language to convey meaningful ideas in communication among people. Regarding the relationship between language and thought, Sam (2017) proposed that

> ... language is influencing thought or thought is influencing the language. The language we speak affects the personality and shapes the brain ... Language is able to "shape" our brains, beliefs and attitudes by changing the way we think and act. Thought is indispensable in language, since without thought on the part of speaker and hearer alike it is impossible to formulate sounds or combinations of sounds intended by the one to convey certain meanings and recognized by the other as bearing those connotations.

In broad sense we can identify language use in at least the following three functions (Kemerling, 2011). First, the informative use of language involves one's effort to convey some content. This kind of language use presumes that the content being conveyed is true, and this informative use of language becomes the focus of logic. Second, the expressive use of language intends to express certain feeling or to evoke some feeling from others. Though using language expressively, such as saying "Ouch!", does not actually express any information, it serves an essential function in human daily life because how people feel often matters as much as what people mean to be true. Finally, the directive use of language aims to make someone or to prevent someone from performing an action. Similar to the expressive use of language, using language for directive function is significant for human interaction but it is not always logically related to what people believe to be true; that is to say, logic is characterized as the study of truths which is based absolutely on the content or meaning of the language (Hintikka, 2019).

LOGICAL REASONING

Logical reasoning is considered a vital element of critical thinking, one kind of higher order thinking skills and also a key skill in the twenty first century, which empowers someone to discover the truth in an assertion and to separate facts from opinions. Developing critical thinking requires the use of different kinds of reasoning to understand a situation, to analyze, evaluate, interpret or synthesize information in order to form an argument, to solve a problem or to reach a conclusion (Liu, Ludu & Holton, 2015; Bronkhorst et.al., 2020). Hence, improving logical reasoning skills is an essential part of developing higher order thinking skills (Zohar & Dori, 2003).

Logical reasoning can be divided into formal reasoning and informal reasoning. Formal reasoning is "characterized by rules of logic and mathematics, with fixed and unchanging premises" (Teig & Scherer, 2016, p. 1). When reasoning logically, people follow a set of rules that determine how they should reach conclusions. Informal reasoning is reasoning that needs to consider the situational context instead of simply applying the rules of logic. Bronkhorst et.al. (2020) proposed that logical reasoning may involve both formal and informal strategies since it should include the way of reasoning and the context.

A research on promoting higher-order thinking of science students through teacher questioning was conducted by Ong, Hart & Poh (2016). The results showed that teacher prompts assist the students to think reflectively. Bronkhorst et.al. (2021) explored developing students' logical thinking by guiding them through various visual modes and formal representation. The findings indicated that the participants "easily link concrete situations to certain iconic referents, such as formal (letter) symbols, but need more practice for others, such as Venn and Euler diagrams" (p. 378). They also indicated that during the transition from concrete to symbolic through the iconic mode, the participants "take a step back to a visual representation, which shows that working on such links is useful for all students" (p.378). So far, there has seemed to be no study examining logical reasoning in relation to language proficiency and spreadsheet program operation.

TOEIC ENGLISH PROFICIENCY TEST

Test of English for International Communication (TOEIC) is an internationally standardized test for non-English speaking people. As an English language proficiency test, it measures test takers' functional language ability and practical language use instead of just the passive knowledge about the language. For that purpose, TOEIC addresses the ability to listen, speak, read and write English for communication in various everyday-life and workplace settings. Doing the TOEIC test, therefore, requires individuals to work with the form (grammatical and lexical aspects) of the language as well as the meaning (semantic and pragmatic features). The latter inevitably involves logical reasoning to result in appropriate and sound arguments.

TOEIC claims to have high reliability, validity and security in scoring process. This is supported by Schmidgall (2017) who pointed out that "TOEIC scores are consistent and reliable, and are not improperly influenced by factors unrelated to language ability" (p.7). In line with the claim, Ito, Ota & Kawaguchi (2002) indicated that the organizations utilizing TOEIC for different purposes are satisfied with the checklist linking concrete tasks to the TOEIC scores.

A few other studies on TOEIC test have been carried out but none of them examines the test with regard to logical thinking skills. Yoo & Manna (2017) investigated the use of CFA models to validate test score interpretation and assessed the factor structure of TOEIC Listening and Reading test. Oliveri & Tannenbaum (2017) who explored the insights into using TOEIC test scores for

human resources decisions were unsuccessful to get complete accurate pictures of different uses of TOEIC test scores. However, their research findings reflect the test user important segment. Zahruni, Fahmi & Pratolo (2020) examined Indonesian vocational students' perception of taking the TOEIC test and revealed that the students prepared for the test by self-learning, by having discussions with peers and by practicing online.

LOGICAL THINKING IN USING MICROSOFT EXCEL

Microsoft Excel is a software program used to create spreadsheets, that is documents in which data is specifically organized in row and columns so that it is simple to read and manipulate. It used widely in business for various kinds of jobs such as performing financial and statistical analysis (Liengme & Ellert, 2009), calculating employee working hours for payroll, keeping track of sales and expenses, creating charts to explain particular performance over time and making forecasts in order to predict trends. Because the spreadsheet program is a powerful analysis tool, the ability to use Microsoft Excel has frequently become a required skill not only for accountants or people working in finance but also in almost all types of professions like in legal, administration, education and scientific fields (Divisi et.al., 2017).

Operating the software requires someone to possess foundational technical knowledge of Excel; in addition, it needs the essential logical thinking skills to get the job done by forming the essential formulas and applying the appropriate functions. In Excel, a formula refers to an equation that performs calculations, returns information, tests condition and manipulates the values in a cell or in a range of cells (Microsoft, 2021). A function is a predefined formula available in the software. In short, a formula is any calculation in using Excel whereas a function is a predefined calculation. Some basic functions in Excel are SUM, AVERAGE, MAX, MIN, COUNT, AND, OR, and IF.

Excel also provides six logical operators to compare two values and the result of the comparison is either TRUE or FALSE. The six logical operators are: 'equal to' (=), 'not equal to' (<>), 'greater than' (>), 'less than' (<), 'greater than or equal to' (>=), and 'less than or equal to' (<=). In practice, the logical operators are commonly used together with Excel logical functions to perform more than one comparison in an Excel formula. For example, the formula "=AND (A3<10, B3>=5)" means that "the formula returns TRUE if a value in cell A3 is less than 10, and a value in cell B3 is greater than or equal to 5, FALSE otherwise". It is obvious that logical thinking is fundamental in working with excel for the step-by-step process of converting facts into raw data, filtering or formulating the data before creating meaningful information, and finally analyzing and executing the meaningful information for a specific purpose.

There have been few studies conducted in relating the application of Excel software program and logical thinking. Bernard & Senjayawati (2019) investigated the improvement of junior high school students in understanding mathematics using Visual Basic Application for Microsoft Excel. They found that there was a significant improvement in the students' ability and there was also a moderate association between their self-confidence and mathematical comprehension skills. A similar study involving primary school students was carried out by Rohaeti, Fitriani & Akbar (2020). They pointed out that students showed higher achievement in ethnomathematical contents after learning using an interactive model with Visual Basic Application for Excel. Narra et.al. (2021) examined the impact of logical arithmetic knowledge on technological knowledge of third year students majoring in Mathematics. The participants were asked among others to use Microsoft Excel to exhibit their analytical skills. The research findings showed that the students' knowledge

of logical arithmetic and their knowledge of technology did not correlate significantly. In another recent study, Yousef (2021) has made a preliminary overview on the improvement of Arab college students' critical thinking skills. The participants joining the Mathematic course were assigned a project requiring them to perform a series of skills, one of which is by using Microsoft Excel to prepare personal budgets. The results indicated that there was a significant improvement in all areas of the students' critical thinking skills.

METHODOLOGY

The subjects of this study were 67 students of a Secretarial college in Surabaya, Indonesia. The students took Computer II course in the second semester of their study. In the previous semester, that is the first semester, the students had taken and passed Computer I course in which they learned about the basics of computer operations and operating Microsoft Word program. Computer and English subjects are considered major subjects in the curriculum of the study program. There are five Computer subjects allocated in the first until the fifth semester. English is learned in different subjects such as Structure, Reading, Listening, Business Correspondence (writing) and Business Communication (speaking), throughout the whole semesters (semester one till six) in the study program.

The data of this study were collected from the students' scores of Computer II course and TOEIC international test. The Computer II scores were the final scores of Computer II course comprised of examination and assignment scores. The TOEIC scores were the scores of TOEIC International test with the institutional schedule, which was obligatory for the students to take after the third semester of their study. Both the scores of Computer II course and TOEIC used for this study were the students' first scores, not the scores of retaken tests.

After the data were collected from the final scores of Computer II course and the scores of TOEIC test, means of the scores were calculated. The sets of data were then analyzed using SPSS Statistics program to see whether there was a significant correlation between them.

FINDINGS AND DISCUSSION

The mean scores of the TOEIC test and Computer II course are shown in Table 1 and Table 2 below. Table 1 indicated that, from the TOEIC score range of 10-990, the lowest score was 190 and the highest score was 825. This showed that the subjects of this study had a very wide range of difference in their English proficiency, with the mean score of 536. The mean score reflected that in average the subjects' English proficiency can be mapped on CEFR B1 Level, or the threshold or intermediate level (Educational Testing Service, 2015), and slightly over the target score (500) as required by the institution.

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TABLE 1. Means of TOEIC Scores

	N	Minimum	Maximum	Mean	Std. Deviation
TOEIC Scores	67	190	825	536.04	126.481
Valid N (listwise)	67				

Table 2 also indicated a wide range of score difference for the computer subject, with the mean score of 63.

TABLE 2. Means of Computer Scores

	N	Minimum	Maximum	Mean	Std. Deviation
Computer Scores	67	19	91	63.01	15.556
Valid N (listwise)	67				

As seen in Table 3, the Pearson correlation between the TOEIC scores and the Computer scores indicated a strong degree of correlation (0.794). The scatter plot showed that almost all subjects who scored higher in Computer also scored higher in TOEIC test.

TABLE 3. Correlation of TOEIC and Computer Scores

		TOEIC Scores	Computer Scores
TOEIC Scores	Pearson Correlation	1	.794[**]
	Sig. (2-tailed)		.000
	N	67	67
Computer Scores	Pearson Correlation	.794[**]	1
	Sig. (2-tailed)	.000	
	N	67	67

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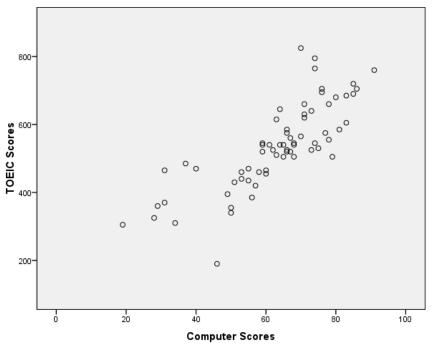The Relationship between English Language Proficiency and Logical Thinking Skills

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FIGURE 1. Scatter Plot of Pearson Correlation of TOEIC and Computer Scores

Based on the results of the data analysis it could be concluded that the students' English proficiency correlated significantly with their academic performance in computer. The students with better logical thinking as indicated by their Computer II final scores significantly performed better in English as shown by their TOEIC scores.

CONCLUSION AND RECOMMENDATION

The findings of the present study indicated that the students' English proficiency correlated significantly with their academic performance in computer. In other words, it can be concluded that students with better logical thinking ability seem to be more successful in learning English as a foreign language. This could be due to that people with strong logical thinking can more easily understand and master the rules of the English language. As a result, they are more capable of using the language for communication.

This study made use of the final scores of Computer II subject to indicate the students' logical thinking ability. The scores are the results of achievement tests, namely the mid-semester and final-semester tests, as well as assignment grades of Computer II subject. The nature of an achievement test is obviously different from that of proficiency test. Therefore, it is suggested that future research in the similar field is done using proficiency tests for both the English proficiency and the logical thinking ability. In addition, it is necessary to take into account that this study has the following particular features: (1) the study is tightly embedded in the research setting and its unique educational contexts, and (2) the subjects are students of Secretarial major with English and Computer as the core subjects. Given these limitations, the findings and interpretations should be carefully generalized to other research contexts. The experiences and attitudes of these students might be different from those of other non-English majors students at other institutions. The

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research results might also be influenced by such factors as individual differences in students' personal traits, learning styles and the learning environment. These factors need to be considered in any similar future research.

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