The Correlation between Controllers' Aviation Knowledge, Listening Comprehension, and IELP at JATSC

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Abstract

The aim of this research is to find the correlation between controllers' aviation knowledge mastery, listening comprehension and ICAO English Language Proficiency (IELP) at Jakarta Air Traffic Services Centre (JATSC). This research focused on controllers as the homogeneity respondent hence the random sampling was the suitable way to get the data. Respondents were selected without taking account of anything. The researcher used quantitative approach method to carry on the project because it was believed that the data would be numerical thing. Meanwhile variable instrument that researcher deployed namely a test. The test itself provided for respondents was implemented into three items. Having got the data after finalising the test, it was analysed by using Product Moment Correlation. The data then was calculated using that method and the result was r calculation 0.371535165 and it was higher than 0.349 and it meant that there was correlation between controllers' aviation knowledge mastery, listening comprehension and IELP.

Keywords: aviation knowledge mastery, listening comprehension, IELP

Introduction

An Air Traffic Controller as a part of job which provides services for pilot flying in defined airspace in order to achieve safely, efficient and effective is not well known for many people. Working in an area inside the airport, an Air Traffic Controller is difficult to recognize by other public community because an airport have some restriction for people to enter. However it is no longer exist, nowadays public society has been getting some knowledge about Air Traffic Controllers itself particularly when an accident occurs involving Air Traffic Controller investigation.

To carry out their job, controllers truly have mastered the aviation knowledge material provided in the exam every six month which is called as a performance check. Kind of questions in it has close relationship with controllers' understanding in daily work. It is essential one that controllers have fully comprehended the material moreover it has been learned several years ago when they studied in their school.

Another important thing based on the requirement, the rule stated on International Civil Aviation Regulation (ICAO) by International regulation that controllers have to achieve the level 4. Controllers might be tested with ICAO English Language Proficiency (IELP) routinely for every three or six year. This one is an essential part which controllers may work in controller working position if their English proficiency below level 4.

In providing services to pilot, controllers have to communicate with using English as media. In this context, controllers may not make mistake in order to give good

services and avoid accident happened. Therefore their English competence must be the need of the international standard required, however some controllers have weaknesses in listening skill particularly when pilot from foreigners speak out and discuss with them. Specific information that a pilot said sometimes was rather difficult to come up with by controllers consequently controllers were unable to respond pilot correctly. These weaknesses of controllers' listening might be indicated by the result of IELP. Some of them got low score on IELP test.

Both aviation knowledge and listening comprehension were considered to influence IELP test score of controllers. Therefore it might be important to know the correlation between aviation knowledge, listening comprehension and IELP. The result of this research would be valuable thing for controllers specifically in order to take account on those matters.

Theoretical Review
Aviation Knowledge Mastery

As stated in ICAO Document, the Annex 11 (2001, pp. 2-2) that the objectives of air traffic services can be defined as follows; (a) prevent collisions between aircraft; (b) prevent collisions between aircraft on the maneuvering area and obstructions on that area; (c) expedite and maintain an orderly flow of air traffic; (d) provide advice and information useful for the safe and efficient conduct of flights; and (e) notify appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required.

Generally aviation knowledge is the thing that an air traffic controller has understood because this one is learned when he or she was in scholar education. Controllers got some materials relating to the daily job they would face in the ground. There are too many subjects in term of improving their skill to handle and manage air traffic. In this context, controllers will get some knowledge whether theory or practice and even practical experience. As seen in the syllabus that it really concerns on the practical knowledge rather than theory one as stated on the syllabus (Organization I. C., First Edition 2017).

Meanwhile certification is the most important thing as well in which controllers has to get before joining other controllers doing their job. Controllers will be examined by certain checker controllers to reach passing grade as determined in the regulation. After passing the examination new controllers will get signature in their license from checker controllers that they are deserved to be controllers in certain jurisdiction.

The result of the test is usually based on the Standard Operating Procedure (SOP) in Air Traffic Services of controller. This SOP declares that; "Each license holder can have more than 1 (one) rating, a maximum of 3 (three) ratings; 1.14.9. *Controller* who carry out tasks in the work unit JATSC required to

have a valid rating based qualifications after passed Proficiency Check (briefing, oral exam / oral, written exams and practice exams) (2018).

Listening Comprehension

As stated by Picard and Velautham that listening comprehension is a vital skill in all areas of academic life. Effective listening is required in order for higher education students to understand formal lectures and tutorials, as well as to interact with other students in small groups, in project work and in social situations (2016 Volume 28 Number 1).

Listening skill is a process in language skill that needs practice by using audio/technology such as a research done by Embi and Latiff (2004) in using E-learning as a tool for learning ESL. (Arono, 2014 Vol 5 No. 1) Sometimes in order to get message from other people, it is also a requirement that technology could be established. It means that it will be easily to find the meaning using that one even though it is not mandatory to do so using media such as technology like; tape recorder, video, film, etc. is the thing that will influence people improving their listening skill.

An expert, Mary Underwood, spoke that to listen successfully to spoken English we needed to be able to work out what speakers meant when they used particular words in particular ways on particular occasions and not simply to understand the words themselves (1989).

When people fail in their listening, the oral communication will be broken down too because the message is not completely delivered. It is not sufficient when listeners receive a little message to continue building up communication actively. It means that listeners are needed very much to understand what the message about. It is therefore an important to give listeners plenty of opportunities to practice the skill of listening in a supportive environment that helps them to learn (Nurpahmi, 2015).

Meanwhile, Nunan asserted in his book that it was not true that listening comprehension simply focused on word. (1991) Another problem was here that many words had more than one meaning and if they were used their less common usage students got confused. (Mustafa Azmi Bingol, Behcet celik, Naci Yildiz, Cagri Tugrul Mart, 2014) Because of that one, focusing on word might not be considered in listening comprehension.

Anderson and Lynch (1988) argued that some difficulties confronted by listeners were mostly influenced by; (a) the organization of information; (b) the familiarity of the topic; (c) the explicitness and sufficiency of the information; (d) the type of referring expressions used; and (e) whether the text described "static" relationship or "dynamic" relationship.

There are some strategies in order to solve the problem relating to the difficulties in listening comprehension as stated below such as; (a) students try to listen and

understand word by word; (b) students assume failure; (c) students do not have an idea of the listening context; (d) students are not conscious of features of connected speech, word stress, or speed of speech; and (e) students are not aware of the listening strategies (G. Artyushina, O. Sheypak, A. Khovrin, V. spektor, October 2011).

As a foreign language learner, it is very crucial to study how to be a good listener. It is a real thing that many foreign language listeners do not understand how to attain it. Some important elements that listeners should be done is that when they listen a second language they must be able to deal with such as; understanding intonation and stress, coping with redundancy and noise, predicting, understanding colloquial vocabulary and understanding different accents (Penny, 1984).

Actually there is another method how to improve people's listening skill is that by extensive listening which is defined as an activity making it can achieve comprehension. This activity is self-directed and it can be conducted suitable time flexibility and get meaningful listening practice. It allows people listen to many kinds of authentic material from internet, such as songs, podcast, news and videos from you tube and one of the benefits of this method is to improve the learners' performance and to be autonomous in their listening, as the result of the chance to access the material at their level and increase the automatically.

In listening comprehension both bottom-up and top-down processing are used to arrive at an understanding of the utterances. If either of them is lacking, we cannot arrive at an exact understanding. For example, if students cannot perceive three or four words out of five words of one speaker's utterance (bottom-up processing), they cannot make guesses or inferences, using their own background knowledge (top-down processing) (Koichi, 2002).

Another thing is that psychological strategies in listening comprehension are classified by (Chamot, 2004) into top-down and bottom-up processes. Top-down process strategies measure listening for the major purpose, predicting, drawing inferences, and summarizing whereas bottom-up process strategies embody listening for specific details, recognizing cognates, and recognizing word-order patterns (Behnam Arabi Zanjani, Siros Izadpanah, 2016).

Refer to some experts above that to comprehend a message from someone producing sound is not easy moreover that English is not mother tongue. It needs strategies how to handle and easy to get information from interlocutor. Concentrating when interlocutor starts speaking is the most important thing that people have to do besides conducting other strategies.

ICAO English Language Proficiency (IELP)

As stated by Brian Day (ICAO, 2002) that; "Language is an imperfect medium for

communication, but with greater awareness of basic linguistic principles, operating personnel can be motivated to adhere more closely to standard phraseology in all air-ground radio exchanges, thus enhancing safety."

The importance of this linguistic awareness can be understood by always keeping in mind to the disastrous results of various accidents which have occurred in the history of aviation, caused by a lack of proficiency or capacity to manage or understand radio communication exchanges, as mentioned by Elizabeth Mathews (ICAO, 2003):

"In March 1977, the worst disaster in aviation history occurred when a controller and pilot, both speaking English as a second language, failed to communicate critical information. As a result, the Boeing 747 crew attempted to take off in low visibility conditions, colliding with another 747 already on the runway."

"In 1990, Avianca Airlines Flight 052, inbound to New York's John F. Kennedy International Airport, crash when it ran out of fuel. The U.S. National Transportation Safety Board (NTSB) determined that the probable cause of the accident was "the failure of the flight crew to adequately manage the airplane's fuel load, and their failure to communicate an emergency fuel situation to air traffic control before fuel exhaustion occurred."

"In 1995, an American Airlines Boeing 757 approaching Cali, Columbia, turned off course, crashing into a mountain side and killing all on board. The air traffic controller later told investigators that the flight crew's last reported position was incongruent with what he understood the aircraft's position to be, but that he did not know how to convey his concern to the crew in English."

It is also very important for English teachers to know and be aware of the importance of this training process for their pilots or air traffic controllers (ATCO) students, considering the high stakes that they have to face when they perform their daily duties using the aeronautical radio-communications.

It should be noted that ICAO recommends ATCO has to get at least level 4 as an operational level. A person in level 4 should be retested every 3 years and a person in level 5 should have a recurrent test after 6 years. In the case of a candidate with level 6 it will not be necessary to re-evaluate them again. As mentioned by Elizabeth Mathews (ICAO, 2003);

"Recurrent testing of pilot and controller language skills is important for two reasons. Firstly, we know that language skills slip if people do not have the opportunity to use and practice them. Conversely, at a certain level of proficiency people do not lose these skills. Retesting is particularly important for individuals with intermediate levels of proficiency who live in places which offer them little opportunity to use their second language."

The result itself can be divided into some levels such as;

ATTACHMENT
ICAO LANGUAGE PROFICIENCY RATING SCALE

1.1 Expert, Extended and Operational Levels

LEVEL	PRONUNCIATION *Assumes a dialect and/or accent intelligible to the aeronautical community.*	STRUCTURE *Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task.*	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
Expert 6	Pronunciation, stress, rhythm, and intonation, though possibly influenced by the first language or regional variation, almost never interfere with ease of understanding.	Both basic and complex grammatical structures and sentence patterns are consistently well controlled.	Vocabulary range and accuracy are sufficient to communicate effectively on a wide variety of familiar and unfamiliar topics. Vocabulary is idiomatic, nuanced, and sensitive to register.	Able to speak at length with a natural, effortless flow. Varies speech flow for stylistic effect, e.g. to emphasize a point. Uses appropriate discourse markers and connectors spontaneously.	Comprehension is consistently accurate in nearly all contexts and includes comprehension of linguistic and cultural subtleties.	Interacts with ease in nearly all situations. Is sensitive to verbal and non-verbal cues and responds to them appropriately.
Extended 5	Pronunciation, stress, rhythm, and intonation, though influenced by the first language or regional variation, rarely interfere with ease of understanding.	Basic grammatical structures and sentence patterns are consistently well controlled. Complex structures are attempted but with errors which sometimes interfere with meaning.	Vocabulary range and accuracy are sufficient to communicate effectively on common, concrete, and work-related topics. Paraphrases consistently and successfully. Vocabulary is sometimes idiomatic.	Able to speak at length with relative ease on familiar topics but may not vary speech flow as a stylistic device. Can make use of appropriate discourse markers or connectors.	Comprehension is accurate on common, concrete, and work-related topics and mostly accurate when the speaker is confronted with a linguistic or situational complication or an unexpected turn of events. Is able to comprehend a range of speech varieties (dialect and/or accent) or registers.	Responses are immediate, appropriate, and informative. Manages the speaker/listener relationship effectively.
Operational 4	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation but only sometimes interfere with ease of understanding.	Basic grammatical structures and sentence patterns are used creatively and are usually well controlled. Errors may occur, particularly in unusual or unexpected circumstances, but rarely interfere with meaning.	Vocabulary range and accuracy are usually sufficient to communicate effectively on common, concrete, and work-related topics. Can often paraphrase successfully when lacking vocabulary in unusual or unexpected circumstances.	Produces stretches of language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make limited use of discourse markers or connectors. Fillers are not distracting.	Comprehension is mostly accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension may be slower or require clarification strategies.	Responses are usually immediate, appropriate, and informative. Initiates and maintains exchanges even when dealing with an unexpected turn of events. Deals adequately with apparent misunderstandings by checking, confirming, or clarifying.

Levels 1, 2 and 3 are on subsequent page.

1.2 Pre-operational, Elementary and Pre-elementary Levels

LEVEL	PRONUNCIATION *Assumes a dialect and/or accent intelligible to the aeronautical community.*	STRUCTURE *Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task.*	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
			Levels 4, 5 and 6 are on preceding page.			
Pre-operational 3	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation and frequently interfere with ease of understanding.	Basic grammatical structures and sentence patterns associated with predictable situations are not always well controlled. Errors frequently interfere with meaning.	Vocabulary range and accuracy are often sufficient to communicate on common, concrete, or work-related topics, but range is limited and the word choice often inappropriate. Is often unable to paraphrase successfully when lacking vocabulary.	Produces stretches of language, but phrasing and pausing are often inappropriate. Hesitations or slowness in language processing may prevent effective communication. Fillers are sometimes distracting.	Comprehension is often accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. May fail to understand a linguistic or situational complication or an unexpected turn of events.	Responses are sometimes immediate, appropriate, and informative. Can initiate and maintain exchanges with reasonable ease on familiar topics and in predictable situations. Generally inadequate when dealing with an unexpected turn of events.
Elementary 2	Pronunciation, stress, rhythm, and intonation are heavily influenced by the first language or regional variation and usually interfere with ease of understanding.	Shows only limited control of a few simple memorized grammatical structures and sentence patterns.	Limited vocabulary range consisting only of isolated words and memorized phrases.	Can produce very short, isolated, memorized utterances with frequent pausing and a distracting use of fillers to search for expressions and to articulate less familiar words.	Comprehension is limited to isolated, memorized phrases when they are carefully and slowly articulated.	Response time is slow and often inappropriate. Interaction is limited to simple routine exchanges.
Pre-elementary 1	Performs at a level below the Elementary level.	Performs at a level below the Elementary level.	Performs at a level below the Elementary level.	Performs at a level below the Elementary level.	Performs at a level below the Elementary level.	Performs at a level below the Elementary level.

Note.— The Operational Level (Level 4) is the minimum required proficiency level for radiotelephony communication. Levels 1 through 3 describe Pre-elementary, Elementary, and Pre-operational levels of language proficiency, respectively, all of which describe a level of proficiency below the ICAO language proficiency requirement. Levels 5 and 6 describe Extended and Expert levels, at levels of proficiency more advanced than the minimum required Standard. As a whole, the scale will serve as benchmarks for training and testing, and in assisting candidates to attain the ICAO Operational Level (Level 4).

Every level has characteristic accordingly and becomes the reference for controllers to validate their English proficiency based on their achievement. To those who get level 6, controllers may not be examined anymore when they work in air

traffic control. They are expected as an expert that is professional in English and no need to have more tests.

Method

It is very important to justify the research approach in doing the study of something in order to get the accurate result and the previously defined goal. The researcher assumed that this study would be conducted as quantitative research approach meaning that this research focused on some variables as the object of research which had to be articulated into operational concept. (Sarwono, 2006) Meanwhile Creswell (2009) stated that quantitative research meant a means for testing objective theory by examining the relationships among variables. These variables could be measured, typically on instruments, so that numbered data could be analysed using statistical procedures. This research used an expose facto by using correlation design.

Creswell (2009) also commented that some alternative strategies or research approach to inquiry data using some methods such as; experimental designs and non-experimental designs such as survey. Quantitative strategies had involved many complex experiments with some variables and treatments.

Paying attention to the data which would be taken as the study being researched and the homogeneity of the sample, it could be assumed that random sampling technique may be accurate to be conducted. As stated by Cohen, Manion and Morrison that there were two main methods of sampling (2007). The researcher must decide whether to opt for a probability (also known as a random sample) or a non-probability sample (also known as a purposive sample). In simple random sampling, each member of the population under study had an equal chance of being selected and the probability of a member of the population being selected was unaffected by the selection of other members of the population, i.e. each selection was entirely independent of the next (L. Cohen, L. Manion, K. Morrison, 2007).

In this research, the researcher used one method in gaining the data from the respondents. This method as a researcher believed that it would be able to get the data completely therefore it was selected using test. This test would be effective to find the data collection that the researcher conducted because this method could measure and defined respondents' ability based on the score measurement table. It was stated that the test was something (such as a series of questions or exercises) for measuring the skill, knowledge, intelligence, capacities or aptitudes of an individual or group.

The instrument that the researcher deployed in finding the data was using a test. Some tests would be given for respondents consisting three materials namely; listening, aviation knowledge and ICAO English Language Proficiency tests. The test would be provided within separate time so

respondents would have some times to prepare facing it.

In this study, the researcher than would use correlational research design which measured of the linear relationship between two interval or ratio variables and could have a value between -1 and 1. Therefore the researcher used the Pearson product moment correlation coefficient as research design because it was employed extensively in social science research as a correlational technique between two variables (x and y) and also in concurrence with numerous uni-variate and multivariate methods (Walker, 2017).

The correlation was also called as correlation analysis which was a term used to denote the association or relationship between two (or more) quantitative variables. This analysis was fundamentally based on the assumption of a straight-line (linear) relationship between the quantitative variables. (J Gogtay, UM Thatte, 2017) In the meantime, according to Gay and Airasian (2000) a correlation described an existing condition where it was distinctly from it correlation provided an estimate of just how relation two variables.

The independent variables of this research were controllers' mastery of aviation knowledge (x1) and listening comprehension (x2) meanwhile the dependent variable was ICAO English Language Proficiency (IELP) as y variable. To find the result of every variable, respondent would be given some tests within three items and every test was accordingly adjusted based on the material provided. Then the result would be computed using Pearson Product Moment Correlation. The result that was (r) compared with (r) table which one was higher or lower.

$$r_{xy} = \frac{\sum xy}{\sqrt{x^2 y^2}}$$

r_{xy} : coefficient correlation value between x and y variable

x : independent variable
y : dependent variable
x : $(x_i - \acute{\alpha})$
y : $(y_i - \breve{y})$

As stated by (Riduwan, 2013) that multiple correlation could be defined as the value which provided the strength of influences or correlation between two variables or more together and another variable. Multiple correlations might contain two independent variables (x1, x2) and another dependent variable called y. The correlation could be illustrated as presented in chart below;
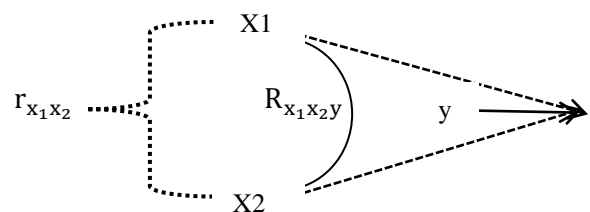
Then in order to find the result of multiple correlations researcher then used this formula as follows;

$$R_{x_1 x_2 y} = \sqrt{\frac{r^2 x_1 y + r^2 x_2 y - 2. r x_1 y . r x_2 y . r x_1 x_2}{1 - r^2 x_1 x_2}}$$
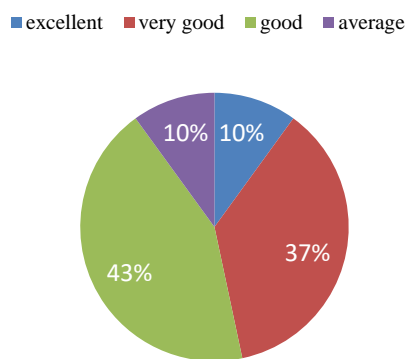
R   :   Coefficient value of multiple correlations

Result

Based on the data collection, a researcher finds the result of controllers' scores as follows;

**Picture 1.** The Result of Aviation Knowledge

This chart showed the result category that respondents got from the aviation knowledge examination. It could be depicted that the highest percentage was 43% which was categorized as a good result. Based on the number of respondents, there were 13 of 30 controllers getting that result. It was around half of the total number of controllers who had a good category on this aviation knowledge. Then it was followed by a very good type that respondent could achieve it. There were 11 respondents who reached this category and it was around one-third of the total respondents. The next one was both categories which were excellent and average ones. It was 10% of total respondents that was around three respondents respectively for every category. It could be said that there were some respondents who had to have a

remedial test before doing their job because of under standard score. As prescribed in Standard Operating Procedure (SOP) that the minimum score to pass the aviation knowledge was 70, so there were three controllers who had to take the second test for improvement.

The next one, the researcher also explored the result of the listening test taken by the respondent as prescribed in the following column picture;

**Picture 2.** The Result of Listening Comprehension
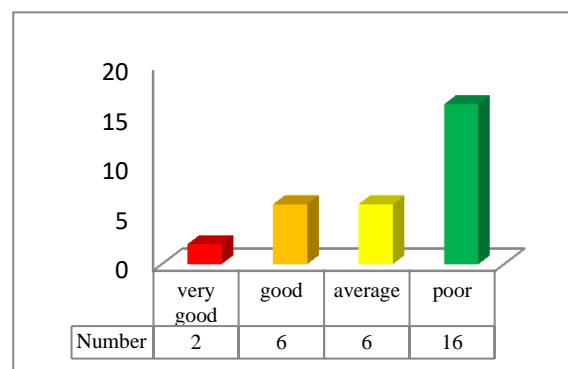
The column chart above described the result of the listening comprehension test taken by respondents. Of 30 respondents almost of them got a low score which more than 50%, namely 16 respondents, could be categorized as poor one. This category dominated the other number of respondent who got in the listening comprehension test. Contrary, there were only two respondents who found a very good category in this listening comprehension test. Meanwhile, the other respondents showed on the same number in which good and average types were namely six respondents respectively.

Simplify that it seemed listening comprehension was quite tricky for respondents therefore many of them got low score rather than in aviation knowledge score that respondent got a better score.

In the IELP test, the result of the examination of the respondent could be summarized as the column picture below;

Picture 3. The Result of IELP Test
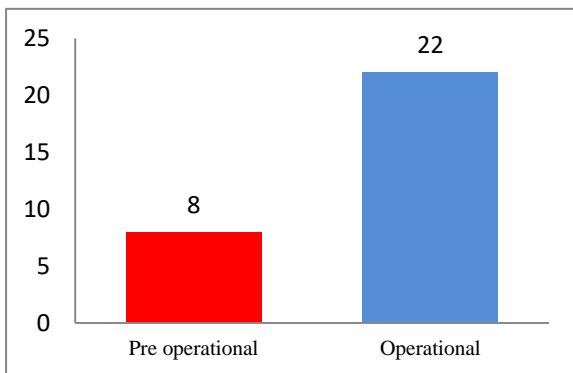
In this test, only two classifications respondents got the result, namely pre-operational and operational level. Based on the result of the test in IELP, there were some respondents getting level 3, meaning that it could be categorized as pre-operational level. As the chart illustrated above, there were eight respondents of 30, around 27 % had low competency in IELP as consequences they had to take a remedial test until passing it. If they could not pass it, there was no excuse working as a controller. On the other hand, there were 22 respondents, 73% got 4 levels as operational categorized. It meant that they might directly work as a controller without retaking test.

Data analysis

Taken from the respondent, there were 30 people that would be analyzed. The data above would be analyzed and calculated by using correlation method among scores using Pearson Product Moment Correlation model.

In order to find the correlation among three elements as given in the above data, the researcher would look for the multiple correlations between two independent variables and one dependent variable. Some steps had to be taken and would be explained one by one in the next calculation below.

Firstly, it had to be found the correlation between aviation knowledge mastery and IELP, which was computed and the result was 0.209627097. Secondly, the researcher continued finding the correlation between listening comprehension and IELP. The result of this correlation after computed it was that 0.36177996. The third step to carry out such correlation was to find the correlation between aviation knowledge mastery and listening comprehension and the result was 0.361452.

Finally to find the correlation among three items, using the formula above, it could be seen that the result of r was 0.371535165. This value then was compared with r table, which was 0.349. Therefore r account was higher than r table (0.371535165 > 0.349). It meant that H0 was accepted and H1 was rejected so it could be concluded that there was a correlation between aviation knowledge mastery, listening comprehension and IELP.

Conclusion

This research was intentionally proposed to find the correlation between controllers' mastery of aviation knowledge, listening comprehension and ICAO English Language Proficiency (IELP) at Jakarta Air Traffic Services Centre (JATSC). As mentioned earlier that this study was designed for specific community who were used to carry out their job, however, there was some unexpected evidence that should not be imparted to controllers. Factually, this could happen to them for several people that become interesting finding in this research.

Refer to that condition above, the researcher had the willingness to conduct the research about what happened actually in this context, and even the researcher saw that it was rather a strange thing. After performing the research, here was the result of a study that the researcher might define as follow;

This correlation consisted of three variables in which two independent variables influence one dependent variable. The calculation using manual arithmetical showed that the result of r is 0.371535165. As seen on the r table with 5% significance that was 0.349 value indication then it was compared with r result, r account was higher than r table (0.371535165 > 0.349). It meant that H0 was accepted and H1 was rejected, therefore it could be summarized that there was a correlation between aviation knowledge mastery, listening comprehension and IELP.

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