

Investigating the Effects of Personality on Second Language Learning through Artificial Neural Networks

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Abstract

The aim of this research is to determine Second Language Acquisition and personality variable from affective factors analyzed by Artificial Neural Network in freshman class of both university students. This study presents an intelligent approach to the investigation of positive effects of personality on second language learning. For this purpose, watching TV, reading books, magazines, newspaper, listening to the radio, talking to a native English friend, and talking to people at school are investigated. The tool of our research is a survey (questionnaire) to collect a data in order to quantify students' personality traits based on affective factors. The questionnaire consists of two parts. The first part consists of Yes/ No questions while the second part uses a 4 point Likert scale with 5 items that indicates what helped students personally to learn English. The participants were 160 students from two private universities in Bosnia and Herzegovina, International Burch University (90 students) and International University of Sarajevo (70). The subjects' major was English. The first part of the survey was analyzed using ANN, and the second part using statistical analysis. Both data analysis were processed by transferring answers to an Excel sheet. For each measure, mode, standard deviation, median were calculated to determine students' personality factors. We used two different types of analysis in order to show that different kinds of analysis can be done.

Keywords: Personality, Second Language Acquisition, Introverts, Extroverts.

1. INTRODUCTION

Second Language Acquisition is a process that can be affected by several factors, one of being the personality of learners. Individual has a different type of personality, so one type of teaching or learning style cannot fit every learner. Individual differences of second language learners have to be recognized in order to make sufficient progress in the development of their learning styles.

Personality can affect a number of factors in people, including the choice of words or learning a language. According to Beukeboom [1], there are two types of personality: introverts, who use more concrete words, in contrast to extroverts who rely more on abstract vague notions. For example; introverts uses more articles (e.g. a, an, the) in their speech, and more numbers and specific people. On the other hand, extroverts are more likely to talk about family and friends, and use words such as 'drinks' and 'dancing' which shows that people who fit in this type of personality are expected to spend more time socializing.

In the process of learning a second language, we involve our whole personality and emotions. We have to analyze our feelings in order to find out what kind of motivation, attitude, or

preferences (e.g. studying alone or in groups) we have. These are the key factors of the second language learning process.

Among various personality measures, the one most commonly used in the field of language learning and teaching are the Myers-Briggs Type Indicator (MBTI) and the Eysenck Personality Questionnaire (EPQ) [2]. MBTI identifies the measures in four categories: Extroversion-Introversion, Sensing-Intuition, Thinking-Feeling, and Judging-Perceiving. Here, there are 8 types of learner who have different types of learning style and differ in the process of learning language. Later, the 100 item EPQ was reduced to include 48 items and identify person's personality in four categories [3]: extroversion (E), neuroticism (N) (or emotionality), psychoticism (P) (or tough-mindedness). Here, the most negative language aptitude is (N): because of high levels of anxiety learners can have difficulties focusing and memorizing during the task.

Furthermore, findings of some studies show that personality traits are based on the assumptions of learners who bring to the classroom not only their cognitive abilities, but also effective states which influence the way they acquire the language. Brown [4] divided personality factors into self-esteem, inhibition, risk-taking, anxiety, empathy, and extroversion. Many studies showed that extroverts are better language learners for they tend to be sociable and are more likely communicate and join groups both inside and outside the class. According to Naiman, Frohlick, Stern and Todesco [5], extroverts who are more sociable are more successful in learning languages than introverts. However, according to Swain and Burnaby [6], well-organized and serious introverts are seen as better learners if they systematically studied.

This study presents an intelligent approach to the investigation of positive effects of personality on second language learning. For this purpose, watching TV, reading books, magazines, newspaper, listening to the radio, talking to a native English friend, and talking to people at school are investigated.

2. MATERIALS AND METHODS

2.1 Artificial Neural Network (ANN)

ANN is a computational model designed to simulate biological neural network systems. It consists of an interconnected group of processing elements named artificial neurons, and it uses a connectionist approach to computation. In most cases an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase."Learning in biological systems involves adjustments to the synaptic connections that exist between the neurons. In the human brain, a typical neuron collects signals from others through a host of fine structures called dendrites. The neuron sends out spikes of electrical activity through a long, thin strand known as an axon, which splits into thousands of branches. At the end of each branch, a structure called a synapse converts the activity from the axon into electrical effects that inhibit or excite activity from the axon into electrical effects that inhibit or excite activity in the connected neurons. When a neuron receives excitatory input that is sufficiently large compared with its inhibitory input, it sends a spike of electrical activity down its axon. Learning occurs by changing the effectiveness of the synapses so that the influence of one neuron on another changes [7]."

The most common neural network model is the multilayered perceptron (MLP) model which consists of an input layer, with a number of neurons equal to the number of variables of the problem; at least a hidden layer, and an output layer, with a number of neurons equal to the target number of quantities computed from the inputs [8]. It has a feed-forward network and supervised learning, because it requires a desired output in order to learn. Supervised learning means that the expected output is included in what the network is to learn [9]. As seen in Fig.1, the ANN architecture, used in this study, is three layered, feed-forward, and back propagation. Sigmoid function is selected as the nonlinear transfer function [10].

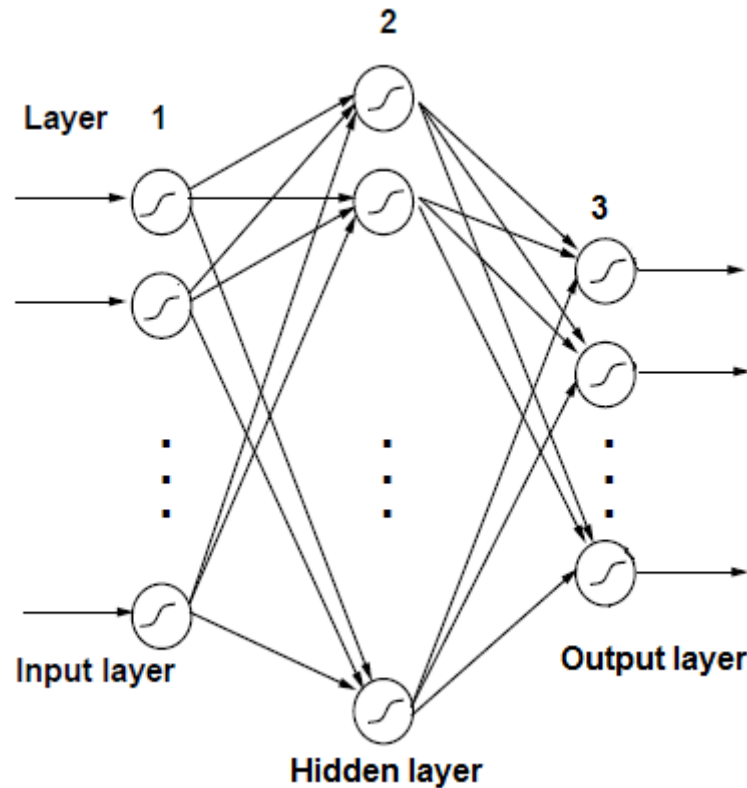


FIGURE 1: The architecture of three layered neural networks.

2.2 Collection of Datasets From Survey Participants

The participants were 160 students from two private universities in Bosnia and Herzegovina, International Burch University (90 students) and International University of Sarajevo (70). The subjects' major was English. Data was collected from English freshman classes at IBU from the following departments: Faculty of Engineering and Information Technologies; Department of Information Technologies (21), Electrical and Electronics Engineering (18), Genetics and Bioengineering (31), and Faculty of Education; Department of English Language and Literature (20). Similarly, from English freshman classes at IUS, data were collected from these departments: Faculty of Arts and Social Sciences; Department of Psychology (13), English Language and Literature (16), Visual Arts and Visual Communication Design (7) and Faculty of Business and Administration; International and Public Relations (15), Economics (4), Management (3), and Faculty of Engineering and Natural Sciences; Computer Science and Engineering (10), and Architecture (2).

2.3 Instruments

The tool of our research is a survey (questionnaire) to collect a data in order to quantify students' personality traits based on affective factors. The questionnaire consists of two parts. The first part consists of Yes/ No questions while the second part uses a 4 point Likert scale with 5 items that indicates what helped students personally to learn English. Students answered this questionnaire individually. The questions were about their behavior in case of using English to figure out the effect of their personalities. We can say that this paper is quantitative research.

2.4 Data Analysis

The first part of the survey was analyzed using ANN, and the second part using statistical analysis. Both data analysis were processed by transferring answers to an Excel sheet. For each measure, mode, standard deviation, median were calculated to determine students' personality factors. We used two different types of analysis in order to show that different kinds of analysis

can be done. In the first part, results are displayed in charts and the second part they are displayed in graphics.

3. RESULTS AND DISCUSSIONS

ACCORDING TO THE SURVEY OF IUS UNIVERSITY (70 STUDENTS)

Question: Have you ever exposed to factors listed below? (Yes/No)

Watching TV	True	False	Accuracy
YES	33	2	%
NO	35	0	97,14
TOTAL	68	2	70

TABLE 1: Evaluation of Watching TV.

Here, positive effects of watching TV on learning English were studied. Accordingly, 2 students out of 70 have been observed as not effective (true negative). MLP structure: 54: 54: 2 (Input for 54 questions of the survey, the number of neurons in the hidden layer 54, and output answer including Yes or No is 2.) Accuracy rate= $68/70 = 97.14\%$. The number of iterations has been 2000 in the entire process.

Reading	True	False	Accuracy
YES	35	0	%
NO	34	1	98,57
TOTAL	69	1	70

TABLE 2: Evaluation of Reading.

Here, positive effects of reading on learning English were studied. Out of 70 students, only one stated that reading was not effective. MLP structure: 54: 54: 2 (Input for 54 questions of the survey, the number of neurons in the hidden layer 54, and output answer including Yes or No is 2.) Accuracy rate= $69/70 = 98.57\%$.

Listening to Radio	True	False	Accuracy
YES	34	1	%
NO	35	0	98,57
TOTAL	69	1	70

TABLE 3: Evaluation of Listening to Radio.

Here, positive effects of listening to the radio were studied. Accordingly, out of 70 students only one stayed that listening to the radio was not affective. MLP structure: 54: 54: 2 (Input for 54 questions of the survey, the number of neurons in the hidden layer 54, and output answer including Yes or No is 2.) Accuracy rate= $69/70 = \%98, 57\%$.

Talking to a native English friend	True	False	Accuracy
YES	35	0	%
NO	35	0	100
TOTAL	70	0	70

TABLE 4: Talking to a native English friend.

Here, positive effects of talking in English with a native speaker were studied. Accordingly: 70 students have been stayed that talking to a native English friend is effective in all cases. MLP structure: 54: 54: 2(Input for 54 questions of the survey, the number of neurons in the hidden layer 54, and output answer including Yes or No is 2.) Accuracy rate= 100%.

Talking to people at school	True	False	Accuracy
YES	35	0	%
NO	35	0	100
TOTAL	70	0	70

TABLE 5: Talking to people at school.

Here, positive effects of talking to people at school were studied. Accordingly: 70 students have been stayed that talking to a native English friend is effective in all cases. . MLP structure: 54: 54: 2(Input for 54 questions of the survey, the number of neurons in the hidden layer 54, and output answer including Yes or No is 2.) Accuracy rate= 100%

EVALUATION OF LANGUAGE LEARNING ACCORDING TO PERSONALITY FOR IUS STUDENTS					
Dataset	Number of Yes	Number of No	Number of True	Number of False	Accuracy (%)
Watching the Television	33	35	68	2	97,14
Reading books, news, magazine etc.	35	34	69	1	98,57
Listening to the Radio	34	35	69	1	98,57
Talking to a native English friend	35	35	70	0	100
Talking to people at school	35	35	70	0	100

TABLE 6: Overall Interpretation.

In results above it can be observed that speech practice of students is rather effective in language learning (native speaker or any people). However, reading, watching TV, and listening to radio also have an impact (minimum 97% above). Here, because of the number of students is not convenient to make distinction between test and training, data have been tested by making cross validation.

ACCORDING TO THE SURVEY OF IBU UNIVERSITY (90 STUDENTS)**Question: Have you ever exposed to factors listed below? (Yes/No)**

Watching TV	True	False	Accuracy
YES	29	4	% 92
NO	17	0	
TOTAL	46	4	50

TABLE 7: Watching TV.

Here, positive effects of watching TV were studied. Regarding to 40 data, out of 90 students who answered 20th question in the survey have been used in training and the rest of 50 data (33 Yes, 17 No) used in testing. According to the test results, it has been observed that watching TV had no effect on 4 of them (true negative). . MLP structure: 54: 54: 2 (Input for 54 questions of the survey, the number of neurons in the hidden layer 54, and output answer including Yes or No is 2.) The results of 2000 iterations are trained with training data and thereafter are tested with test data. All the MLP structure (from 20 to 24) regarding optimum rate of learning 0.9 and momentum constant were found 0.7. Accuracy rate= $46/50 = \%92$. The number of iterations has been 2000 in the entire process.

Reading	True	False	Accuracy
YES	29	4	% 90
NO	16	1	
TOTAL	45	5	50

TABLE 8: Reading.

Here, positive effects of reading were studied. According to 90 students who are studying at IBU, regarding 40 data have been used in training and the rest of 50 data (33 Yes, 17 No) used in testing. Out of 50 only 5 students from the test data have been observed that reading was not affective. From these, 4 of them are true negative and 1 of them is false negative. MLP structure: 54: 54: 2 (Input for 54 questions of the survey, the number of neurons in the hidden layer 54, and output answer including Yes or No is 2). Accuracy rate= $45/50 = \%90$.

Listening to Radio	True	False	Accuracy
YES	24	2	% 96
NO	24	0	
TOTAL	48	2	50

TABLE 9: Listening to the Radio.

Here, positive effects of listening to radio were studied. According to 90 students who are studying at IBU, regarding 40 data have been used in training and the rest of 50 data (26 Yes, 24 No) used in testing. Out of 50 students only 2 from the test data have been observed that listening to the radio was not affective. MLP structure: 54: 54: 2 (Input for 54 questions of the survey, the number of neurons in the hidden layer 54, and output answer including Yes or No is 2). Accuracy rate= $48/50 = \%96$.

Talking to a native English friend	True	False	Accuracy
YES	39	3	% 94
NO	8	0	
TOTAL	47	3	50

TABLE 10: Talking to a native English friend.

Here, positive effects of talking in English with a native speaker were studied. According to 90 students who are studying at IBU, regarding 40 data have been used in training and the rest of 50 data (42 Yes, 8 No) used in testing. Out of 50 only 3 students from test data have been observed that talking to native English friend was not affective. MLP structure: 54: 54: 2 (Input for 54 questions of the survey, the number of neurons in the hidden layer 54, and output answer including Yes or No is 2). Accuracy rate= $47/50 = \%94$.

Talking to people at school	True	False	Accuracy
YES	36	2	% 100
NO	12	0	
TOTAL	48	2	50

TABLE 11: Talking to people at School.

Here, positive effects of talking to people at school were studied. According to 90 students who are studying at IBU, regarding 40 data have been used in training and the rest of 50 data (38 Yes, 12 No) used in testing. Accordingly, 50 students have been observed that talking to people at school was affective. MLP structure: 54: 54: 2 (Input for 54 questions of the survey, the number of neurons in the hidden layer 54, and output answer including Yes or No is 2). Accuracy rate= $48/50 = \%96$.

EVALUATION OF LANGUAGE LEARNING ACCORDING TO PERSONALITY FOR BURCH STUDENTS					
Dataset	Number of Yes	Number of No	Number of True	Number of False	Accuracy (%)
Watching the Television	29	17	46	4	92
Reading books, news, magazine etc.	29	16	45	5	90
Listening to the Radio	24	24	48	2	96
Talking to a native English friend	42	8	47	3	94
Talking to people at school	36	12	48	2	96

TABLE 12: Overall Interpretation.

As can be seen from the results given above, speech practice of students who are studying at IBU have been observed rather effective in language learning (talking people at school and listening to the radio). However, reading, watching TV and talking with the native speaker's also have a great influence (the lowest 90% of the above). In figure below, the positive effect of speaking with native speakers on learning English occurred in the test stage of ANN determination.

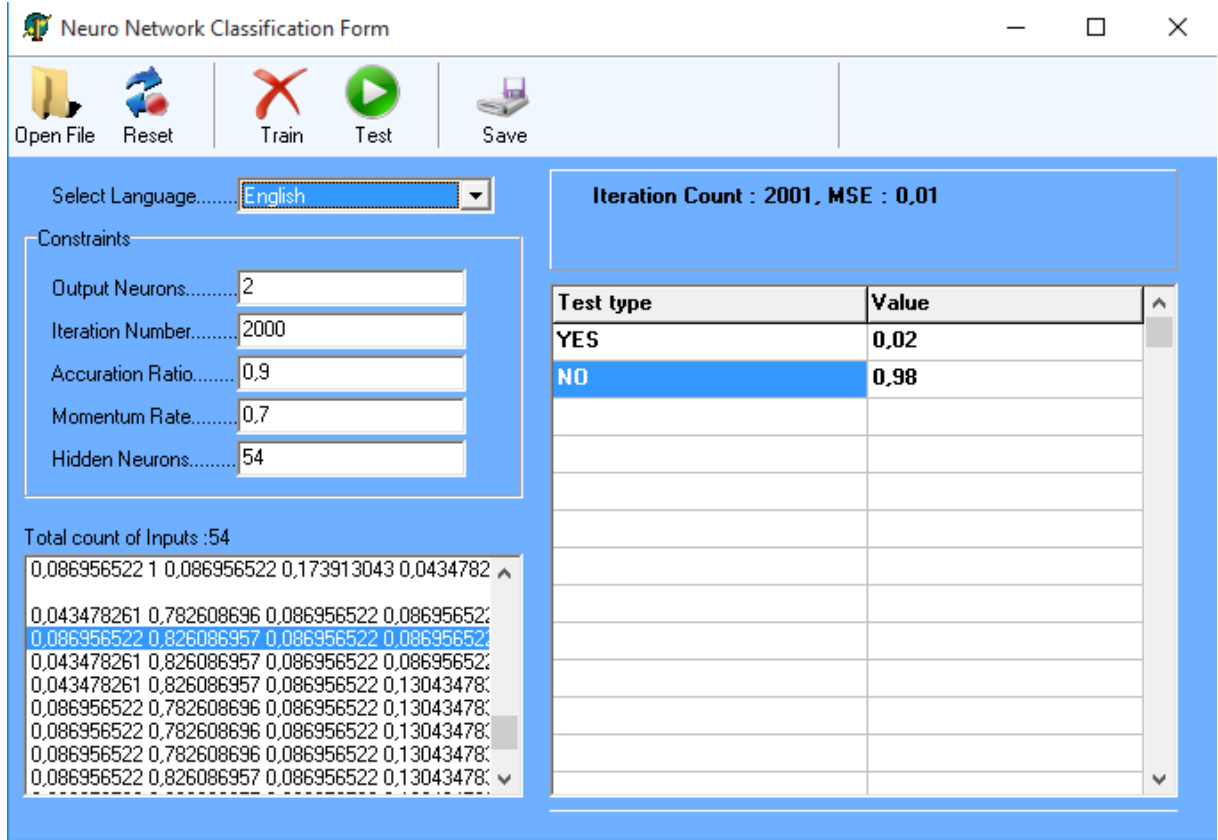


FIGURE 2: User Interface of the ANN Program.

ACCORDING TO THE SURVEY OF BOTH UNIVERSITIES, IUS AND BURCH, (70 + 90 = 160 STUDENTS)

Which of the following helped you personally to learn English?

	Strongly Agree-1	Agree-2	Strongly Disagree-3	Disagree-4
6)My school study	28+33=61	35+44=79	3+3=6	4+10=14
7)Private study	22+34=56	30+41=71	4+6=10	14+9=23
8)Speaking English with family members	9+13=22	10+14=24	17+21=38	34+42=76
9)Speaking English outside with friends	28+24=52	28+45=73	6+5=11	8+16=24
10)Travelling & studying in English-speaking countries	30+29=59	18+26=44	10+14=24	12+21=33

TABLE 13: Evaluation of Questions.

According to the statements of both survey results above is seen that total 160 (70+90) students have been answered to all questions from 6 to 10. In terms of question 6, out of 160 students 61 have responded with strongly agree (1 case), 79 of them agree (2 cases), 6 of them strongly disagree (3 cases) and 14 of them disagree (4 cases). According to this, the graphic of both university students' effect on learning English in school is shown in Figure- 3 below.

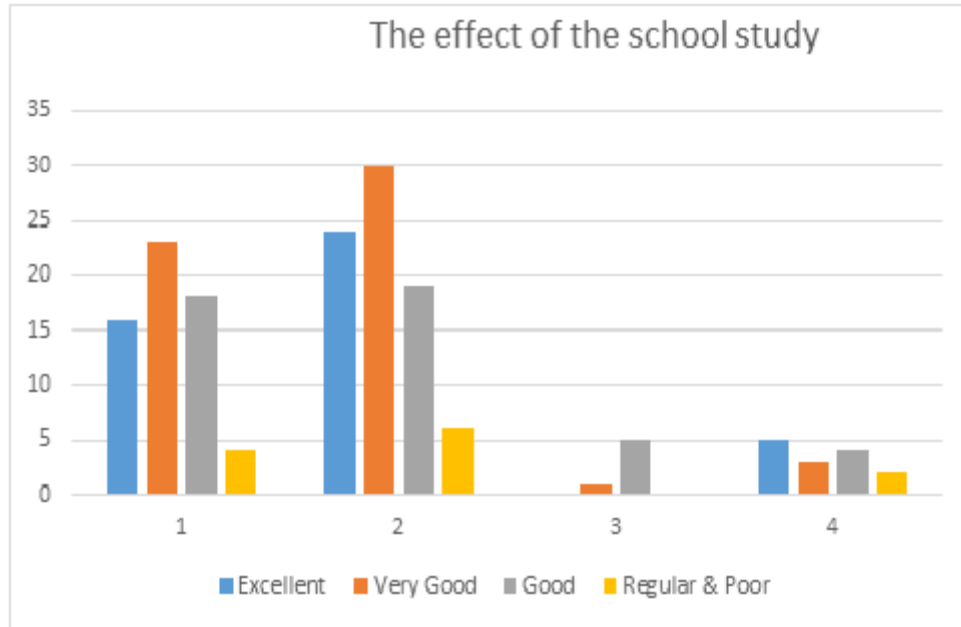


FIGURE 3: The effect of studying in school on English learning.

In terms of question 7, 56 out of 160 students have responded with strongly agree (1 case), 71 of them agree (2 cases), 10 of them strongly disagree (3 cases) and 23 of them disagree (4 cases). According to this, the graphic for the effect of private study on English learning in both groups of university students is shown in Figure-4 below.

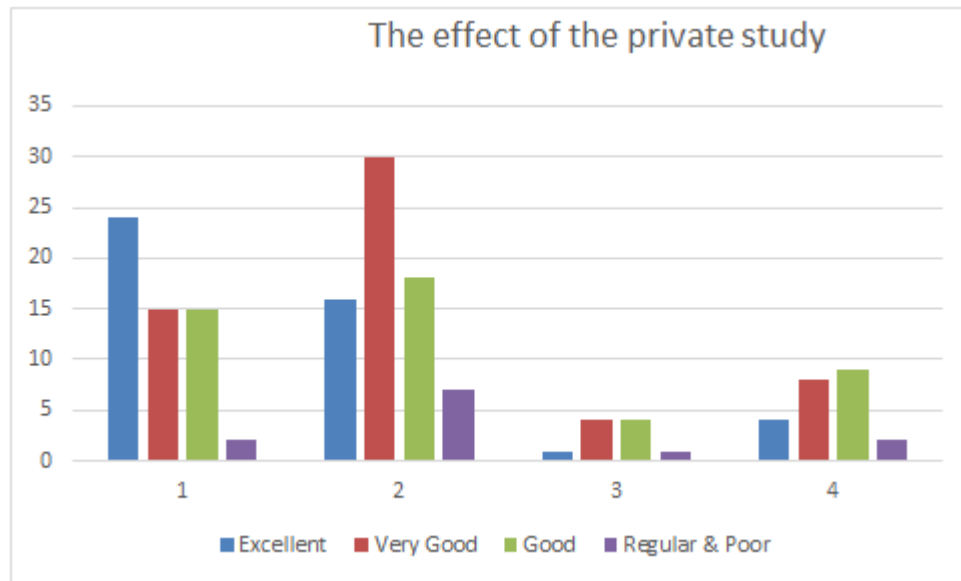


FIGURE 4: The effect of private study (one's own) on English learning.

In terms of question 8, 22 out of 160 students have responded with strongly agree (1 case), 25 of them agree (2 cases), 38 of them strongly disagree (3 cases) and 75 of them disagree (4 cases). According to this, the graphic for the effect of speaking English with family members on English learning in both university students is shown in Figure- 5 below.

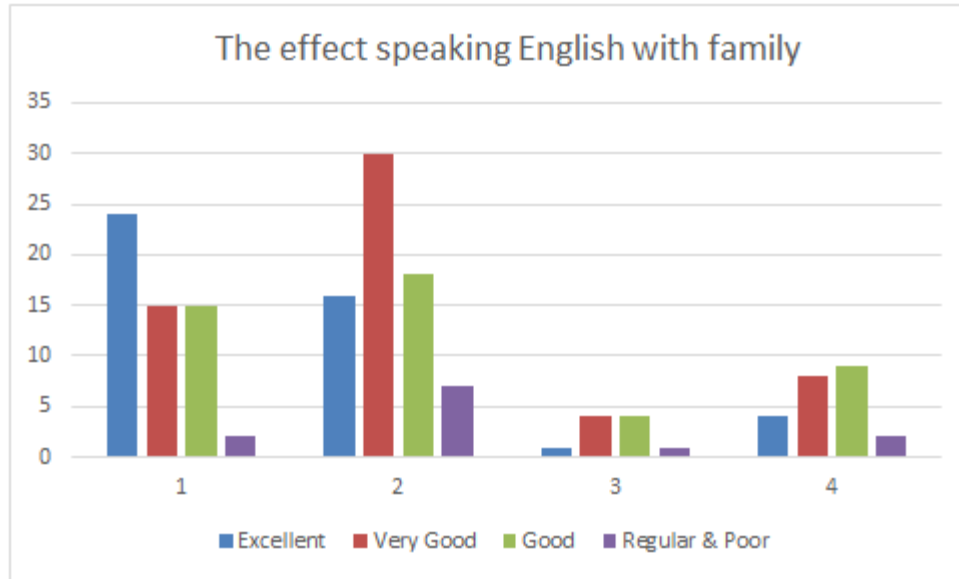


FIGURE 5: The effect of speaking English with family members on English learning.

In terms of question 9, 52 out of 160 students have responded with strongly agree (1 case), 73 of them agree (2 cases), 10 of them strongly disagree (3 cases) and 25 of them disagree (4 cases). According to this, the graphic for the effect of speaking English outside with friends on English learning in both university students is shown in Figure-6 below.

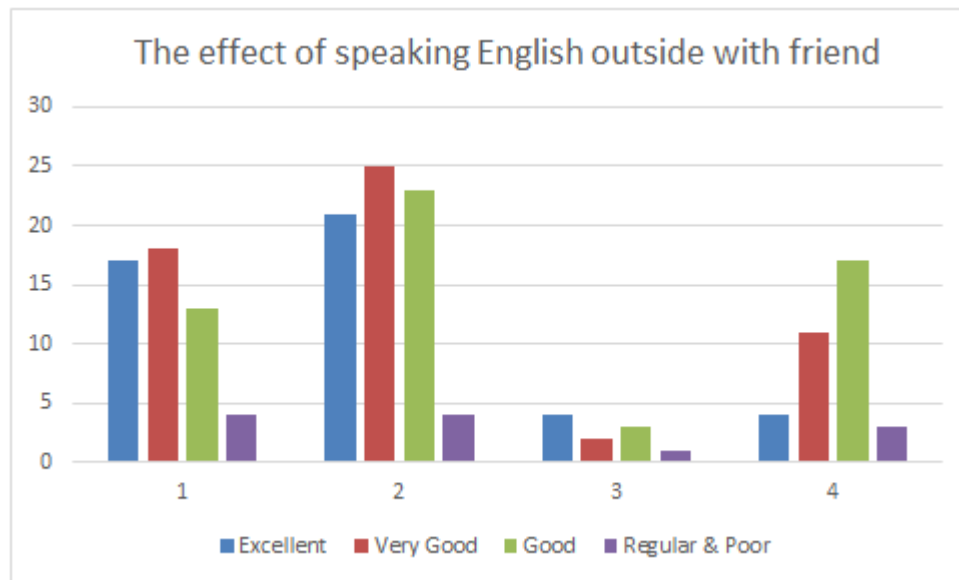


FIGURE 6: The effect of speaking English outside with friends on English learning.

In terms of question 10, 59 out of 160 students have responded with strongly agree (1 case), 45 of them agree (2 cases), 23 of them strongly disagree (3 cases) and 33 of them disagree (4 cases). According to this, the graphic for the effect of travelling & studying in English-speaking countries on English learning in both university students is shown in Figure-7 below.

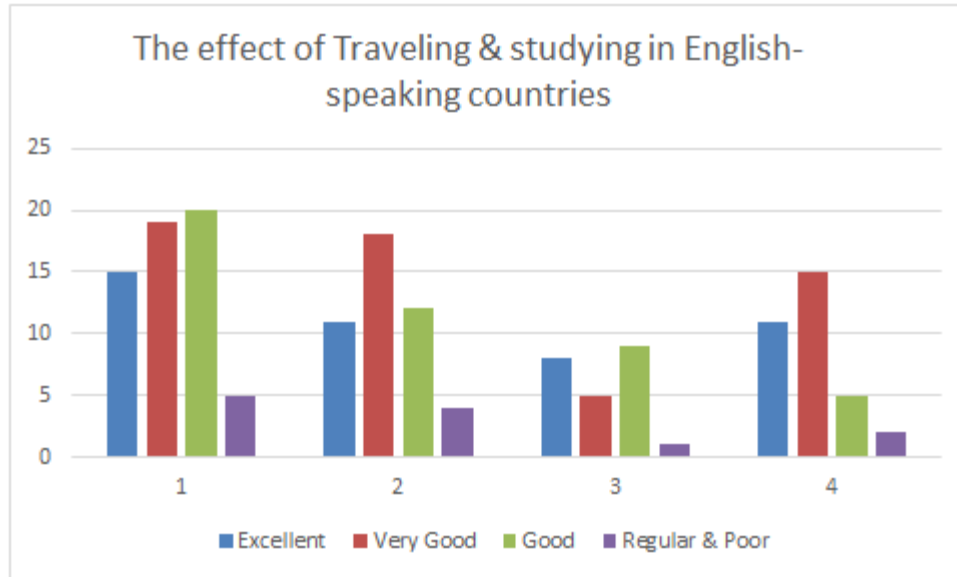


FIGURE 7: The effect of travelling & studying in English-speaking countries on English learning.

4. CONCLUSION

In this study, we present how personality factors affect Second Language Learning. First part of the survey was analyzed by ANN. In terms of IUS University, the accuracy rate by order of first 5 questions is; 97, 14 %, 98, 57%, 98, 57%, 100%, 100%. In terms of IBU University, the accuracy rate by order of first 5 questions is; 92%, 90%, 96%, 94%, 96%.

Second part of the survey was analyzed using statistical analysis. In both universities, we have divided 160 students English level as; excellent, very good, good and regular& poor by the effect of the questions. In terms of question 6, 45% of students are excellent, 57% very good, 44% good, 14% regular& poor level. In terms of question 7, 45% of them are excellent, 57% very good, 45% good, 14% regular& poor level. In terms of question 8, 45% of them are excellent, 57% very good, 46% good, 12% regular& poor level. In terms of questions 9, 36% of them are excellent, 56% very good, 56% good, 12% regular& poor level. In terms of question 10, 45% of them are excellent, 57% very good, 45% good, 13% regular& poor level.

As you can see above, we have tried to estimate student's ability in English from the perspective of personality with two different types of analysis. Existing Artificial Neural Network program may be used in different surveys by other applications for English training. It is possible to evaluate the same data and compare with Artificial Neural Network for making collaboration with an expert of data mining and machine learning methods using other artificial intelligence or machine learning methods. These other methods are; genetic algorithm, particle swarm optimization (PSO), and artificial bee colony (ABC).

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