

## Multiple Linear Regression for Academic Achievements for Public Universities in Malaysia

Nasuhar Ab.Aziz<sup>1\*</sup>, Farahan Mirhani Ishak<sup>2</sup>, Hariz Aiman Mat Yusoff<sup>3</sup>, Umami Sharmimi 'Aradaton<sup>4</sup>, Siti Nurhafizah Mohd Shafie<sup>5</sup>, Mohd Noor Azam Nafi<sup>6</sup>, Azzah Amran<sup>7</sup>, Wan Zakiyatussariroh Wan Husin<sup>8</sup>, Syazwani A. Malek @ Abdul Malek<sup>9</sup>

<sup>1,2,3,4,5,6,8</sup>Faculty of Computer and Mathematical Sciences, UiTM Kelantan, Kota Bharu Campus, 15150 Kelantan, Malaysia

<sup>7,9</sup>Faculty of Business and Management, UiTM Kelantan, Kota Bharu Campus, 15150 Kelantan, Malaysia

\*Corresponding author: [nasuha978@uitm.edu.my](mailto:nasuha978@uitm.edu.my)

Received: 28 September 2022; Accepted: 1 November 2022; Available online (in press); 23 November 2022

### ABSTRACT

*The relationship between socioeconomic status (SES) and academic achievement has been thoroughly studied in earlier educational research. Explanatory research design was employed to assess the effects of SES on the academic achievement of students for public universities students. A survey self-administered questionnaire distributed to 300 students of UiTM Kota Bharu. Multiple linear regression (MLR) is one of the most popular techniques used in analyzing and predicting academic performance. Hence, the aims of this study to evaluate MLR in finding the relationship between family SES and academic performance. It was found that parent's educational level, parent's employment, parent's income, home environment were significant factors that affected students' performance.*

**Keywords:** Academic achievement, Multiple linear regression (MLR), public universities, socio-economic status (SES)

## 1 INTRODUCTION

Education is a tool that provides individuals with knowledge, skill, technique, and information, as well as the ability to comprehend their rights and duties toward family, society, and country. Education provides access to the world's knowledge. It cultivates a way of life and is the most important factor in the country's development [1]. Globally, every student enters school with a different set of circumstances, which are family structure, home environment, and SES can all be privileged or disadvantageous in terms of academic success. The American Psychological Association (APA) defines SES as an individual's or group's social standing or class, which is typically quantified as a mix of education, income, and occupation. A learner's ability to succeed in a formal educational setting might be influenced by his or her familial situation [2]. According to the American Psychological Association, children from lower socioeconomic status households develop academic skills at a slower rate than children from higher socioeconomic status families. Several researchers have examined the relationship between socioeconomic status and academic achievement to acquire a better understanding of these changes in higher education systems, and have discovered a weak to

moderate correlation [3-5]. There are various factors that have been highlighted as the barriers to students that have significantly affected their academic performance. In a study by Bakar et al. [6], parents' educational levels have been thought to be predictors of children's academic success. According to Kapinga [7], parents with a particular degree constitute the social capital of the family. Parents who are knowledgeable and engaged in their children's homework contribute to the improvement of the home learning environment [8]. Ahmad [9] states that when children witness their parents' behaviour, it will indirectly stimulate their response to their parent's behaviour that supports and involves them in their education, the reciprocal process will occur, encouraging and motivating children to succeed in their studies. Other than that, family income, which includes socioeconomic status, has the largest impact on their children's education. Poor parents are unable to invest enough in their children's education [9]. According to Kainuwa and Yusuf [10], the main reason students from low socioeconomic status drop out of school or parents do not send their children to school is that they cannot afford the registration fee, admission fee, PTA fee, exam fee, cost of book, cost of uniform, cost of transportation fee from home to school, and other daily monetary demands. In addition, occupation is one of the factors that affect the socioeconomic status of parents, because their jobs provide for their families' necessities. In a study by Gabriel et al. [11] mentioned occupation as a determinant of parents being able to spend enough time with their children to help them with schoolwork, advise them, and attend school visits. According to the recent studies, learning also takes place in a variety of settings, including the home. In addition, as a result of COVID-19, schools around the globe were compelled to close, displacing about 1.2 billion students from their classrooms [12]. As a rapid response, home learning was recommended as a solution to any potential educational deficiencies. Malaysia reported the first case of Covid-19 in the beginning of 2020, and the number of reported cases is expected to increase until the end of the year. Movement control order (MCO), often known as partial lockdown, is a crucial action implemented by the Malaysian government to prevent the spread of COVID-19 throughout the country. Students and teachers are under pressure to comply with the new requirement, which is to adopt Open Distance Learning (ODL).

During the Pandemic of Coronavirus, most people face problems in economic status including university students and families. Some students have a lack of motivation after months of studying via Open and Distance Learning (ODL). The study indicates that students are unmotivated and unable to adjust to this new educational environment [13]. They are unmotivated because of socioeconomic position problems such as they need to earn money to assist their parents who are facing occupation problems because of this pandemic. According to the Human Resources Ministry, 99,696 Malaysians lost their jobs from March to November 27 of this year due to the execution of the movement control order (MCO). Therefore, the aim of this paper is to fill the gap by extending the study done by previous researchers in investigating the factor SES by including home environment as one of the factor in predicting the academic performance of a public university in Malaysia.

## **2 MATERIAL AND METHODS**

### **2.1 Data Collection**

A cross-sectional study analysis was used as the research design for this study to review the impact of a family's socioeconomic condition on an academic performance of the students at Universiti Teknologi MARA (UiTM) Kota Bharu. Data were obtained primarily by an electronic survey that was sent to 1382 full-time undergraduate students in 301 samples from the UiTM Kota Bharu's faculties

of business and management and computer and mathematical sciences. Given the size of the study's general population, it is possible to divide it into subgroups according to programmes. As a result, stratified random sampling was used to randomly choose the samples.

The questionnaires consisted of six sections: Section A, Section B, Section C, Section D, and Section E. Section A comprised a handful of demographic questions. Meanwhile, Section B contains questions regarding the student's academic achievement. Section C asked about parent's education level, Section D about parent's income, Section E about parent's employment, and Section F about home environment. Except for Sections A and B, all questions were measured using a 5-point Likert scale with values ranging from 1 to 5, which correspond to strongly disagree, disagree, neutral, agree, and strongly agree. The questionnaire was adapted and enhanced from prior study conducted by Sulaiman et al. (2020) and Realyvásquez-Vargas et al (2020). The research equipment utilised in this investigation are listed in Table 1.

Table 1: Division of Questionnaire

| Section | Construct                      | No. of Questions | Source                           |
|---------|--------------------------------|------------------|----------------------------------|
| A       | Demographic Profile            | 7                |                                  |
| B       | Student's Academic Achievement | 7                |                                  |
| C       | Parent's Educational Level     | 6                | Sulaiman et al., [14]            |
| D       | Parent's Income                | 6                |                                  |
| E       | Parent's Employment            | 6                |                                  |
| F       | Home Environment               | 6                | Realyvásquez-Vargas et al., [15] |

## 2.2 Data Analysis

Statistical Package for Social Scientists (IBM SPSS) version 24.0 software was used to conduct the inferential statistical analysis. Cronbach [16] proposed a basic test in reliability analysis to examine the internal consistency by connecting the output on each of the items in a study with the overall test results by using the Cronbach's alpha value. The value of alpha must not be less than 0.8 in the reliability analysis for intelligence tests and must not be less than 0.7 in the reliability analysis for performance tests [17]. Descriptive analysis (frequency and percentage) was performed to describe the respondents' demography.

### 2.2.1 Correlation Analysis

According to Hauke and Kossowski [18], a scale for assessing the strength of the association between the linear variables is the Pearson product-moment correlation coefficient. As a ratio or an interval, the degree of linearity between the variables will be determined. This analysis was used to examine the correlation between parent's SES (parent's educational level, parent's employment, parent's income, home environment) and students' academic achievement. There is a significant relationship between the variables when the p-value is smaller than significant value (0.05).

### 2.2.2 Multiple Linear Regression Analysis

Multiple linear regression (MLR) was used in this study to identify the factors (parent’s educational level, parent’s employment, parent’s income, home environment) affecting students’ academic achievement. The multiple linear regression models in this study were shown as in Equation (1) below:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon \tag{1}$$

whereby,

$Y$  : Student’s academic achievement

$\beta_0$  : the  $Y$ -intercept of the regression plane

$\beta_1, \beta_2, \beta_3, \beta_4$  : the regression coefficients or the parameters of the model assumptions.

$X_1, X_2, X_3, X_4$  : parent’s educational, parent’s income, parent employment, home environment, respectively.

$\varepsilon$  : a random error

The model was assessed by analyzing the model assumption, model significant ( $F$ -test), test for independent variables ( $t$ -test), and model fitness (coefficient of determination,  $R$ -square). There were three assumptions that would be tested which are normality of residuals, homoscedasticity, and independence assumption.

## 3 RESULTS AND DISCUSSION

### 3.1 Demographic Profile of Respondents

Table 2 shows the demographic profile of the respondents. Most of the respondents were between the ages of 21 to 24, accounting for 90.7% of the total 273 respondents. Then there was the age group of 18 to 20 years old, which received 6.6% of the vote with 20 responses. Only eight people above the age of 25 responded, accounting for 2.7% of the total. It shows that there were 201 female responses, or 66.8%, and 100 male respondents, or 33.2%. 75.8% (228 respondents) of the total respondents came from the faculty of business and management, and the remaining respondents came from the faculty of computer and mathematical sciences, accounting for 24.2% (73 respondents) of the total.

Table 2: Backgrounds of respondents

| Variables              | Frequency  | Percentage (%) |
|------------------------|------------|----------------|
| <b>Age</b>             |            |                |
| 18 - 20 years old      | 20         | 6.6            |
| 21 - 24 years old      | 273        | 90.7           |
| 25 years old and above | 8          | 2.7            |
| <b>Total</b>           | <b>301</b> | <b>100.0</b>   |

|                                    |            |              |
|------------------------------------|------------|--------------|
| <b>Gender</b>                      |            |              |
| Female                             | 201        | 66.8         |
| Male                               | 100        | 33.2         |
| <b>Total</b>                       | <b>301</b> | <b>100.0</b> |
| <b>Faculty</b>                     |            |              |
| Business and Management            | 228        | 75.8         |
| Computer and Mathematical Sciences | 73         | 24.2         |
| <b>Total</b>                       | <b>301</b> | <b>100.0</b> |

### 3.2 Reliability Analysis

The reliability test of pilot study for all factors, including Parent's Educational, Parent's Income, Parent's Employment, and Home Environment in Table 3. Cronbach's Alpha values for pilot study are 0.845, 0.915, 0.885 and 0.801 for sections Parent's Educational, Parent's Income, Parent's Employment, and Home Environment respectively. Meanwhile, Cronbach's Alpha of actual research results are 0.933, 0.944, 0.93 and 0.871 respectively. Since all of the values are larger than 0.7, means that all of the variables are considered reliable [17].

Table 3: Results of reliability test

| <b>Variables</b>           | <b>Pilot Study</b> | <b>Actual Study</b> |
|----------------------------|--------------------|---------------------|
| Parent's Educational Level | 0.845              | 0.933               |
| Parent's Income            | 0.915              | 0.944               |
| Parent's Employment        | 0.885              | 0.939               |
| Home Environment           | 0.801              | 0.871               |

### 3.3 Multiple Linear Regression Analysis

The assumptions of multiple regressions must be met in order to guarantee the correctness of the results from the regression analysis. Simple P-P plots can be used to test the assumption that error terms are normal. The error terms are normally distributed if a positive linear line is seen. A scatter plot of the residuals versus the predicted values can be drawn to see if the error terms have a constant variance. Then, by plotting the residuals against a sequence of events, the random pattern would occur if the residuals should be independent.

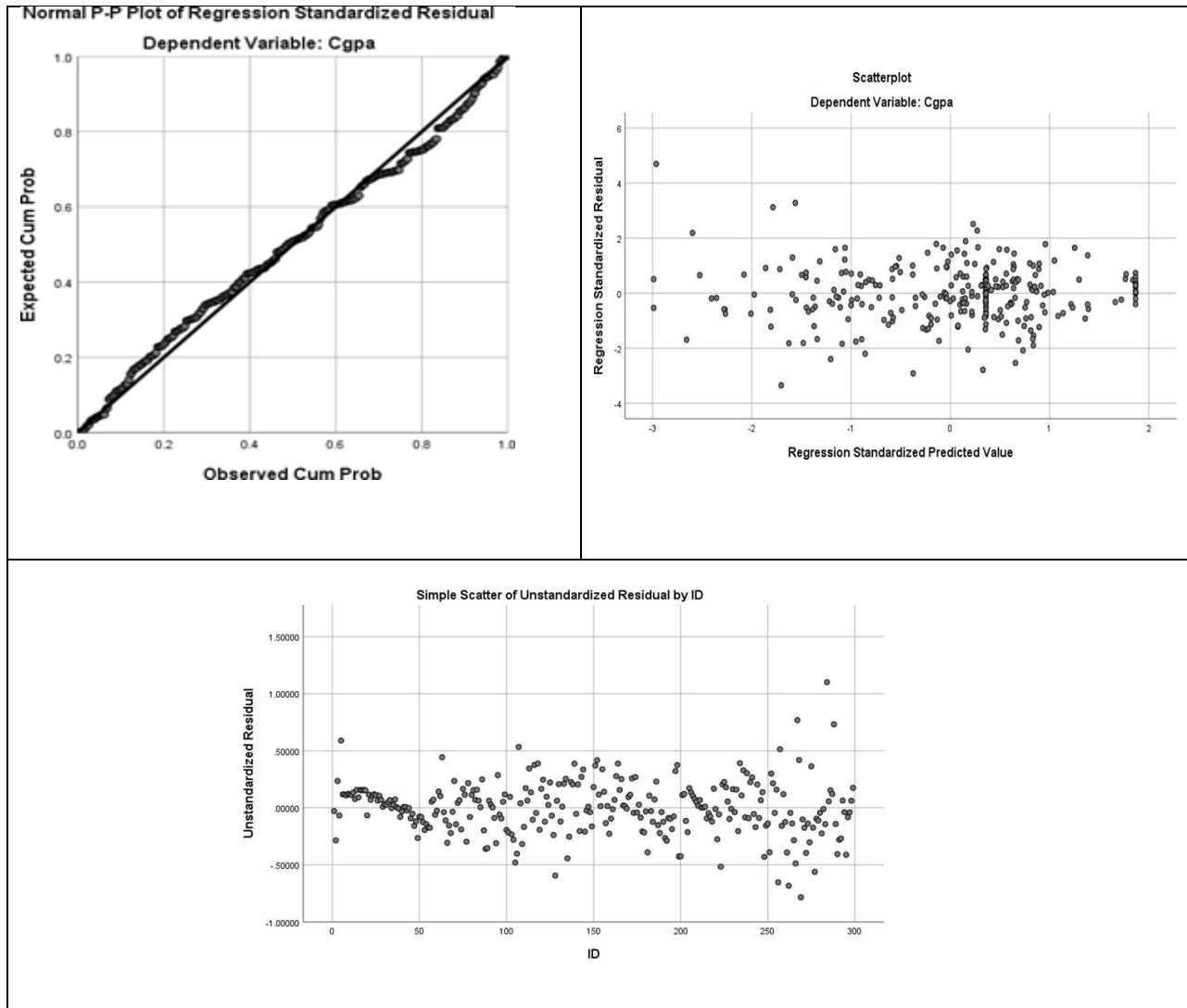


Figure 1: Plot for normality, homoscedasticity and independency of residual

The P-P plot in Figure 1 demonstrated that all points roughly lie on the straight line. As a result, the assumption of normality of errors was met. Additionally, the scatter plot of the residual value against the predicted value shows that all the points were dispersed at random. As a result, the variance of the residuals was constant. The assumption of homogeneity of error variance was met as a result. The points were dispersed at random, as seen by the scatter plot of residual versus run order. This demonstrated the independence of the residuals. The assumption of independence was satisfied.

### 3.4 Correlation Analysis

Based on in Table 4, it shows that that all independent variables (Parent's Educational, Parent's Income, Parent's Employment, and Home Environment) have significant relationship to the dependent variable (Student's Academic Achievement) since their  $p$ -values were less than 0.05. The Pearson Correlation values for Parent's Educational Level versus Student's Academic Achievement

and Home Environment versus Student’s Academic Achievement were 0.678 and 0.537, respectively. This suggests that these factors have a moderately positive association. Besides, it can be seen that Parent’s Income and Parent’s Employment have a strong positive correlation with Student’s Academic Achievement since the correlation values were more than 0.7.

Table 4: Correlation Analysis

| Variable                       | Parent’s Educational Level           | Parent’s Income                      | Parent’s Employment                  | Home Environment                     |
|--------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| Student’s Academic Achievement | $r = 0.678$<br>( $p$ -value = 0.000) | $r = 0.790$<br>( $p$ -value = 0.000) | $r = 0.719$<br>( $p$ -value = 0.000) | $r = 0.537$<br>( $p$ -value = 0.000) |

### 3.5 Multiple Linear Regression Model

Multiple regression analysis was carried out to identify the factors which are Parent’s Educational, Parent’s Income, Parent’s Employment, and Home Environment affecting students’ academic achievement. Table 5 indicates that the regression model is significant since  $F = 221.896$  and  $p$ -value  $< 0.05$ . Moreover, the multiple correlations ( $R = 0.8660$ ) of four significant predictors with the dependent variable. It shows that factors that influence the students’ academic achievement are Parent’s Educational, Parent’s Income, Parent’s Employment, and Home Environment. The four factors have a significant effect size that explains 75% of the variability towards the students’ academic achievement.

Table 5: Model assessment

| Criteria                              | Value                                 |
|---------------------------------------|---------------------------------------|
| General Fitness of Model ( $F$ -Test) | $F = 221.896$ ( $p$ -value $< 0.01$ ) |
| Goodness of Fit ( $R$ -Square)        | $R^2 = 0.750$                         |
| Multiple Correlation ( $R$ )          | $R = 0.8660$                          |

According to the results in Table 6, the significant value of the four variables was less than 0.05. This showed that all four independent variables, namely Parents’ Educational Level, Parents’ Income, Parents’ Employment, and Home Environment, had a significant influence on the Student’s Academic Achievement. Additionally, all of the variables’ tolerance values (TOL) and variance inflation factors (VIF) were greater than 0.1 and less than 10, respectively. This demonstrated the absence of multicollinearity.

Table 6: Regression Results

| Variable                   | B     | t-statistic | p-value | TOL   | VIF   |
|----------------------------|-------|-------------|---------|-------|-------|
| (Constant)                 | 1.426 | 15.267      | 0.000   | -     | -     |
| Parents' Educational Level | 0.057 | 2.399       | 0.017   | 0.361 | 2.773 |
| Parents' Income            | 0.238 | 10.098      | 0.000   | 0.347 | 2.879 |
| Parents' Employment        | 0.062 | 2.412       | 0.016   | 0.288 | 3.476 |
| Home Environment           | 0.239 | 9.982       | 0.000   | 0.852 | 1.174 |

Hence, the estimated final model of students' academic achievement ( $\hat{y}$ ) was as equation 2:

$$\hat{y} = 1.426 + 0.057X_1 + 0.238X_2 + 0.062X_3 + 0.239X_4 \quad (2)$$

where,

$X_1$  = Parents' Educational Level,  $X_2$  = Parents' Income,  $X_3$  = Parents' Employment and  $X_4$  = Home Environment

#### 4 CONCLUSION

Based on the regression analysis conducted, it can be highlighted that parents' educational level, parents' income, parents' employment and home environment are some of the variables that were found to be the factors of the academic achievement of public universities students. As the R-square was high, it can be concluded that there was a significant correlation between parent's SES (parent's educational level, parent's employment, parent's income, home environment) and students' academic achievement. As a result, the most influential factors that affected students' academic achievement were parent's educational level, parent's employment, parent's income and home environment as all four independent variables were significant in this research.

#### REFERENCES

- [1] "Importance of education in life." The Asian School. <https://www.theasianschool.net/blog/importance-of-education/> (accessed July 03, 2021)
- [2] J. Liu, P. Peng, B. Zhao, and L. Luo, "Socioeconomic status and academic achievement in primary and secondary education: A meta-analytic review," *Educational Psychology Review*, pp. 1-30, Jul. 2022.
- [3] M. Richardson, C. Abraham, and R. Bond, "Psychological correlates of university students' academic performance: A systematic review and meta-analysis," *Psychological Bulletin*, vol. 138, no. 2, pp. 353-387, Mar. 2012.



- [4] P. R. Sackett, N. R. Kuncel, A. S. Beatty, J. L. Rigdon, W. Shen, and T. B. Kiger, "The role of socioeconomic status in SAT-grade relationships and in college admissions decisions," *Psychological Science*, vol. 23, no. 9, pp. 1000-1007, Aug. 2012.
- [5] P. A. Westrick, H. Le, S. B. Robbins, J. M. Radunzel, and F. L. Schmidt, "College performance and retention: A meta-analysis of the predictive validities of ACT® scores, high school grades, and SES," *Educational Assessment*, vol. 20, pp. 23-45, Mar. 2015.
- [6] N. A. Bakar, I. Mamat, and M. Ibrahim, "Influence of parental education on academic performance of secondary school students in Kuala Terengganu," *International Journal of Academic Research in Business and Social Sciences*, vol. 7, no. 8, pp. 296-304, 2017.
- [7] O. S. Kapinga, "The impact of parental socio-economic status on students' academic achievement in secondary schools in Tanzania," *International Journal of Education*, vol. 6, no. 4, pp. 120-132, Oct. 2014.
- [8] L. Tsung and F. Gao, "What accounts for the underachievement of South Asians in Hong Kong? The voices of Pakistani and Nepalese parents," *Educational Research*, vol. 54, no. 1, pp. 51-63, Mar. 2012.
- [9] A. Ahmad, "The influence of parents' support and its relationship with students achievement in english education," presented at the International Conference on Education and Regional Development (ICERD), Bandung, Indonesia, Nov. 2016, pp. 657-662.
- [10] A. Kainuwa and N. B. Yusuf, "Influence of socio-economic and educational background of parents on their children's education in Nigeria," *International Journal of Scientific and Research Publications*, vol. 3, no. 10, pp. 1-8, Oct. 2013.
- [11] N. M. Gabriel, L. N. Muli, I. Muasya, T. Maonga, and J. M. Mukhungulu, "Parental socio economic status and student' academic achievement in selected secondary schools in urban informal settlements in westlands division, Nairobi county," *International Journal of Education And Socio Science*, vol. 3, no. 1, pp. 43-55, Jan. 2016.
- [12] C. Li and F. Lalani. "The COVID-19 pandemic has changed education forever. This is how." World Economic Forum. <https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning> (accessed July 03, 2021)
- [13] A. S. Azmi and L. S. May, "The impact of open distance learning (ODL) on students' performance in Universiti Teknologi MARA Kelantan Branch," in *i-LedHS' 21 Proc. of the International Conference on Language, Education, Humanities & Social Sciences*, UiTM Kelantan Branch, UiTM Press, February 22, 2021, pp. 406- 409.
- [14] N. F. C. Sulaiman, N. H. M. Akhir, N. E. Hussain, R. M. Jamin, and N. H. Ramli, "Data on the impact of socioeconomic status on academic achievement among student Malaysian public universities," *Data in Brief*, vol. 31, pp. 2352-3409, Aug. 2020.

- [15] A. Realyvásquez-Vargas, A. A. Maldonado-Macías, K. C. Arredondo-Soto, Y. Baez-Lopez, T. Carrillo-Gutiérrez, and G. Hernández-Escobedo, "The impact of environmental factors on academic performance of university students taking online classes during the covid-19 pandemic in Mexico," *Sustainability*, vol. 12, no. 21, pp. 1-22, Nov. 2020.
- [16] L. J. Cronbach, "Coefficient alpha and the internal structure of tests," *Psychometrika*, vol. 16, no. 3, pp. 297-334, Sep. 1951.
- [17] P. Kline, *A Handbook of Psychological Testing*, 2nd ed. London: Routledge, 1999, pp. 25-50.
- [18] J. Hauke and T. Kossowski, "Comparison of values of Pearson's and Spearman's correlation coefficients on the same sets of data," *Quaestiones Geographicae*, vol. 30, no. 2, pp. 87-93, Jun. 2011.