Exploring the Relationship between Self-efficacy and Mathematics Performance in Integral Calculus among Applied Science University Students

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Abstract. Perceived self-efficacy refers to the people’s beliefs in their capabilities to exert control over their own functioning and over events that affect their live. Accessing student self-efficacy can provide educator with additional insight of students’ subsequent performance. Hence, this study examined the relationship between self-efficacy and mathematics performance among Applied Science university students. The sample consisted of first year Applied Science university students from two different backgrounds; matriculation and diploma. Students were given two sets of survey questionnaire which were developed by the authors to measure the students’ self-efficacy and their ability to solve the integral calculus questions. The questions were divided into four domains namely concept of calculus, translation from concept to formula, techniques of integration and recognition of functions. The findings from this study did not fully provide evidence to support the view that positive self-efficacy beliefs in mathematics increase mathematics performance since there was no significant impact on what the students perceived and what they actually scored. However, this study found out that if the aspects of self-efficacy were to be examined individually to see if there was any significant impact towards mathematics performance, it can be seen that Techniques of integration \( (r = 0.243, p < 0.05) \) and Recognition of function \( (r = 0.205, p < 0.05) \) were significant and positively related to mathematics performance to some extent. The study also showed that self-efficacy is correlated with all of the aspects of performance which the correlations values are as follows: Concept in Calculus \( (r = 0.730, p < 0.01) \), Translation from Concept to Formula \( (r = 0.705, p < 0.01) \), Techniques of integration \( (r = 0.852, p < 0.01) \) and Recognition of function \( (r = 0.773, p < 0.01) \). The results of this study can help the educators to evaluate and improve the effectiveness of the current mathematics teaching.

1. Introduction
Self-efficacy refers to the students’ beliefs in their abilities to master new skills and tasks, often in specific academic domain [1]. Beliefs in self-efficacy can affect life choices, level of motivation, resilience to adversity and vulnerability to stress and depression [2-3]. These beliefs are developed by four main sources of influence namely mastery experiences, social models’ experiences, social persuasion and inferences from somatic and emotional states of personal strengths. A strong sense of efficacy enhances human accomplishments in many ways. People with high assurance in their
capabilities approach difficult task as challenges and maintain strong commitment to master them through sufficient effort and acquirable knowledge. In contrast, a person with low sense of self-efficacy avoids difficult tasks, gives up quickly and cannot sustain his/her effort in the face of failure.

In the context of academic setting, self-efficacy refers to students’ beliefs of their capabilities in solving a specific academic task or to reach a specific goal. Findings from previous researches show strong association between self-efficacy and student learning outcomes [4-5] and these research findings strengthened Bandura’s claim that self-efficacy beliefs play an influential role in human agency [6-7].

Mathematics holds a prominent place in the academic curriculum, and academic success in this subject is imperative in this age of rapid scientific and technological level that academic self-beliefs become more pronounced. High mathematics self-efficacy correlates with greater persistence on long and difficult problems, and greater accuracy of computation [8-9].

A research done by Ahmad and Safaria [10] shows how self-efficacy developed and the way it influences students’ academic performance in addition to social interaction with peers. They found that the Pakistani high school students with high self-efficacy obtained higher scores on 50 mathematical problems test. Further study of the content analysis of interviewees’ responses showed that students with high self-efficacy planned to study complex subjects in the future. While the analysis of data on research done by Motlagh et. al. [11] on high school students in Iran revealed that self-evaluation, self-directing and self-regulation are correlated with academic achievement. This work is supported by the research done by Ayotola [12] on Oyo state secondary school students which revealed that there is a strong positive relationship between mathematics self-efficacy and achievement in mathematics.

Motivated by the research done by many researches on the relationship between self-efficacy and academic performance, the main objective of this study is to explore the relationship of self-efficacy on the mathematics performance in integral calculus of students from two different background namely diploma and matriculation. In addition, this study will identify whether self-efficacy has any relationship with the past mathematics performance. The findings of this study can help the mathematics educators to evaluate and improve the effectiveness of the current mathematics teaching and learning specifically at the faculty and the university as a whole.

2. Methodology
A sample of 98 first-year students from the Faculty of Applied Sciences Universiti Teknologi MARA (UiTM) from two different backgrounds, namely; matriculation and diploma, was selected to respond to the research questionnaires. They were given two sets of questionnaires to measure their self-efficacy and to solve the integral calculus problems. The arrangement of the items and its associated integral problems is shown in table 1.

The instrument which was developed by the researchers was an 18-item questionnaire of integration problems. The same integral problems were used in both questionnaire for self-efficacy and mathematics performance. The problems were designed to be able to measure the students’ Concept in integral calculus, Translation from concept to formula, Techniques of integration, and Recognition of functions. For the self-efficacy subscale, students were asked to rate their confidence in being able to solve the integral questions. A ten-point Likert type scale was used ranging from Not Confidence at All (1) to Completely Confident (10). 30 minutes was given for completing the self-efficacy test. Once completed, the students were given an hour for solving the integral calculus problems. The total marks for solving the integral questions is 45. Their answers were marked, and the scores were recorded.

A pilot test was carried out to determine the validity and reliability of the instruments. The questionnaire was given to a group of 28 students of the same academic background as the targeted sample of this study. The purpose of the pilot test was to check the clarity of the questions and the time required for the respondents to complete the questions. It was noted that the respondents required one hour to complete the test. The instrument was also checked for its reliability using Cronbach Alpha value. Cronbach’s Alpha ranges between 0 and 1, with the value closer to 1, the greater the internal consistency of the items in the scale. According to George and Marley [13], the following rules of thumb
could be applied to interpret the value of Cronbach’s Alpha: _ > 0.9 – Excellent, _ > 0.8 – Good, _ > 0.7 – Acceptable, _ > 0.6 – Questionable, _ > 0.5 – Poor and _ < 0.5 – Unacceptable. The 18 items instrument gave an alpha value of 0.957. Hence, the self-efficacy instrument in this study could be considered as excellent.

### Table 1. The Items and Its Associated Integral Problems

| Item | Integral Problem |
|------|------------------|
| 1 - 2 | Students were given a shaded area region. They were asked to describe the region and represent the area using an integral notation. |
| 3 - 6 | Students were given various shaded areas with their associated area. The students were asked to find the values of a given integral equations based on the areas given. |
| 7 - 9 | Students were given definite integral problems. They were asked to sketch an appropriate region represented by the integral and evaluate using area formula from plane geometry. |
| 10 - 13 | Students were to use appropriate techniques to evaluate integral problem. |
| 14 - 16 | Students were to identify the technique of integration to evaluate indefinite integrals. |
| 17 – 18 | Students were to use any method to solve indefinite integrals. |

The data collected was examined for any misfit to ensure that only high-quality data was analyzed. The cleaned data was then analyzed using IBM SPSS Statistics V 25.0 based on the objectives of the study. Frequency, mean, standard deviation, median and coefficient of variation were used to summarize several aspects of self-efficacy such as concept in calculus, translation from concept to formula, techniques of integration and recognition of functions.

An exploratory factor analysis (EFA) was conducted to examine the construct validity of the self-efficacy scale. Since the purpose is to verify the items that make up each construct; in this case, the four aspects of self-efficacy discussed earlier, principal axis factor analysis was applied. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were examined. Then, the factors were rotated to find a better fit for the data. Varimax rotation was chosen for its ability to produce factor loading that is either very high or very low, making it easier to match items with its construct. While high value of communalities indicated that the items value was strongly related to the other items in the construct, high value of factor loadings, on the other hand, indicate that the items belong to that construct. The rotation eigenvalues were calculated to determine the number of factors to extract. A cut of point of 1 was used. Then, Cronbach’s Alpha value were to calculated for each aspect in the self-efficacy scale which was concluded in the exploratory factor analysis earlier.

Pearson Product Moment Correlation analysis was also employed to examine the inter-relationship between the mathematics performance of the respondents during secondary level and tertiary level. In addition, how every aspect in self-efficacy generally impact the respondents’ mathematics performance was also examined.

In order to look at the impact of these aspects simultaneously towards mathematics performance, multiple linear regression was performed. Before modelling the mathematics performance, the data was tested for its normality. Multiple linear regression model assumptions were tested using several diagnostic plots of the residuals such as histogram, normal probability plot and scatter plot. The performance of the model was evaluated using the adjusted R² and the overall F-test. All tests in this study were conducted at the 10 percent level of significance since it is of exploratory in nature.
3. Results and discussion
This section will address; first, the descriptive in self-efficacy and mathematics performance among the students and then the relationship between self-efficacy and mathematics performance in integral calculus.

3.1. Exploratory Factor Analysis and Reliability Analysis Results.
Table 2 showed the KMO for the sample data was found to be 0.862 suggesting that the correlations among items is good for conducting factor analysis. The Bartlett’s test of sphericity, $\chi^2 = 2315.792$ with p-value $< 0.001$ indicating that the correlation matrix among the items was not an identity matrix.

| Table 2. KMO and Bartlett's Test |  |
|----------------------------------|--|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | .862 |
| Bartlett's Test of Sphericity |  |
| Approx. Chi-Square | 2315.792 |
| df | 153 |
| Sig. | .000 |

| Table 3. Communalities and Pattern Matrix using Principal Axis Factoring Extraction Method |  |
|----------------------------------|--|
| Scale Item | Communalities | Factor Loadings |
| | Initial | Extraction | 1 | 2 | 3 | 4 |
| Item 1 | .712 | .686 | .835 |
| Item 2 | .694 | .574 | .642 |
| Item 3 | .939 | .909 | .857 |
| Item 4 | .948 | .933 | .861 |
| Item 5 | .907 | .899 | .885 |
| Item 6 | .850 | .797 | .844 |
| Item 7 | .881 | .894 | .830 |
| Item 8 | .806 | .665 | .695 |
| Item 9 | .777 | .793 | .827 |
| Item 10 | .862 | .762 | .765 |
| Item 11 | .884 | .786 | .796 |
| Item 12 | .888 | .824 | .821 |
| Item 13 | .850 | .769 | .866 |
| Item 14 | .899 | .842 | .882 |
| Item 15 | .922 | .819 | .859 |
| Item 16 | .915 | .765 | .819 |
| Item 17 | .934 | .862 | .906 |
| Item 18 | .937 | .884 | .922 |
| Percentage of Variance | 37.58 | 20.69 | 14.86 | 8.23 |
| Eigenvalue | 6.764 | 3.725 | 2.674 | 1.481 |
| Cronbach’s Alpha | 0.967 | 0.922 | 0.967 | 0.838 |
All the initial communalities and the extracted communalities were larger than 0.75. Four factors were extracted. The rotation eigenvalue for all four factors were 6.937, 3.832, 2.890 and 1.754 respectively. 85.63% of total variance in all the item was accounted for all four factors. For each factor, the factor loadings were high ranging from 0.77 to 0.93. All these values are shown in table 3.

A reliability analysis was conducted on the 18 items instrument in the self-efficacy scale. The reliability coefficient (Cronbach’s alpha) was 0.943, indicating a high internal consistency among the items of the instrument. Cronbach’s Alpha coefficient for each aspects of the self-efficacy shown in table 4. The result indicates that the Self-efficacy scale has acceptable levels of internal consistency as the coefficients ranged between 0.838 to 0.967.

### Table 4. Internal Consistency Coefficients (Cronbach’s Alpha) of the Self-efficacy Aspects

| Items | Aspects                                | Alpha Coefficient |
|-------|----------------------------------------|-------------------|
| 1     | Item 1 – 18                            | Self-efficacy Overall | 0.943 |
| 2     | Item 1 – 6                             | Concept in calculus | 0.967 |
| 3     | Item 7 – 9                             | Translation from concept to formula | 0.922 |
| 4     | Item 10 – 16                           | Techniques of integration | 0.967 |
| 5     | Item 17 - 18                           | Recognition of functions | 0.838 |

### 3.2. Descriptive statistics.

Of the total 98 students who contributed in this study, 32 students were from diploma background and 66 were from matriculation background.

#### 3.2.1. Self-efficacy. The students were required to identify their confidence level (self-efficacy) towards answering the questions using a score of 1 through 10. A score of 1 indicated Not confident at all while a score of 10 indicated Completely confident. Some summary statistics are given in table 5.

### Table 5. Descriptive statistics for aspects of self-efficacy

| No | Aspects of Self-efficacy | Minimum | Maximum | Mean | Standard deviation | Median | Coefficient of variation (cv) |
|----|---------------------------|---------|---------|------|--------------------|--------|-------------------------------|
| 1  | Self-efficacy Overall    | 2.68    | 9.42    | 5.98 | 1.56               | 5.91   | 26.1                          |
| 2  | Concept in calculus      | 2.00    | 9.33    | 5.23 | 1.68               | 5.00   | 32.1                          |
| 3  | Translation from concept to formula | 3.00 | 10.00 | 5.92 | 1.97 | 6.00 | 33.3 |
| 4  | Techniques of integration | 2.50    | 10.00   | 6.46 | 1.91               | 6.43   | 29.5                          |
| 5  | Recognition of functions | 1.50    | 10.00   | 6.31 | 2.28               | 6.00   | 36.1                          |

The minimum and maximum value of 2.68 and 9.42, respectively, suggests that their confidence level varied quite a lot, from almost Not confident at all to almost Completely confident. An average student
was found to be moderately confident (mean value of 5.98) with their mathematical abilities concerning Calculus. Overall, the student’s self-efficacy is quite consistent with coefficient of variation (cv) is 26.1%.

The students had varied confidence level towards Recognition of functions, as shown from the high coefficient of variation (cv) value of 36.1% as compared to other aspects. However, the small (cv) of 29.5% implied that they were more consistent in terms of Techniques of integration.

3.2.2. Mathematics performance. The students were required to solve the same 18 questions, which were asked earlier, within 1 hour. The questions carried different scoring ranging from 1 through 5.5 marks. They were graded by the experts and carried a maximum mark of 45. Three levels of achievement, which were equally distributed, were designed as in table 6.

| Range of percent | Distribution (%) | Level |
|------------------|------------------|-------|
| 0.00 – 33.29     | 33.3             | LOW   |
| 33.30 - 66.59    | 33.3             | MEDIUM|
| 66.60 – 100.00   | 33.3             | HIGH  |

Table 7. Descriptive statistics of mathematics performance

| No | Aspects                          | Total marks | Minimum | Maximum | Mean  | Standard deviation | Median |
|----|----------------------------------|-------------|---------|---------|-------|--------------------|--------|
|    | Mathematics performance Overall  | 45          | 4.50    | 34.50   | 18.89 | 6.80               | 16.50  |
| 1  | Concept in calculus              | 15          | 0.00    | 15.00   | 6.12  | 3.92               | 6.00   |
| 2  | Translation from concept to formula| 8          | 0.00    | 8.00    | 2.38  | 1.63               | 2.00   |
| 3  | Techniques of integration        | 19          | 0.00    | 16.50   | 7.26  | 3.39               | 7.00   |
| 4  | Recognition of functions         | 3           | 0.00    | 3.00    | 1.77  | 1.32               | 2.00   |

Table 8. Scores and associated level for mathematics performance

| No | Aspects                          | Total marks | Mean  | Percentage | Level  |
|----|----------------------------------|-------------|-------|------------|--------|
|    | Mathematics performance Overall  | 45          | 18.89 | 42         | MEDIUM |
| 1  | Concept in calculus              | 15          | 6.12  | 40.8       | MEDIUM |
| 2  | Translation from concept to formula | 8          | 2.38  | 29.8       | LOW    |
| 3  | Techniques of integration        | 19          | 7.26  | 38.2       | MEDIUM |
| 4  | Recognition of functions         | 3           | 1.77  | 59         | MEDIUM |
The results of mathematics performance in general was presented in table 7 and table 8. The statistics suggests that an average student scored 18.89 marks out of 45, which is equivalent to 42% performance. According to table 6, an average student from the sample was considered as Medium scorers.

In terms of Concept in calculus, an average student scored 6.12 out of 15, which translate to 40.8% (Medium scorer). Translation from concept to formula achieved an average of 2.38 out of 8 (29.8%) which is Low scorer. While Techniques of integration achieved an average of 7.26 out of 19 (38.2%) this is Medium scorer. Recognition of functions on average scored 1.77 out of 3 which is equivalent to 59% which is Medium scorer.

3.3. Ranking of All Four Aspects in Self-efficacy and Mathematics Performance.

Ranking of the four aspects for self-efficacy and performance based on their scores is presented in table 9 and figure 1.

### Table 9. Rankings of the four aspects

| No | Aspect                      | Self-efficacy | Mathematics Performance |
|----|-----------------------------|---------------|-------------------------|
| 1  | Concept in calculus         | Rank 4        | Rank 2                  |
| 2  | Translation from concept to formula | Rank 3      | Rank 4                  |
| 3  | Techniques of integration   | Rank 1        | Rank 3                  |
| 4  | Recognition of functions    | Rank 2        | Rank 1                  |

The rankings suggest what the students think they can do and what they actually scored with respect to calculus were quite at par for Recognition of functions and Translation from concept to formula. However, way beyond their expectation for Concept in calculus and Techniques of interpretation.

3.4. Relationship of Self-efficacy and Current Mathematics Performance with Past Mathematics Performance.

In order to identify whether self-efficacy has any relationship with the past mathematics performance, a correlation analysis using Spearman Correlation Coefficients were calculated. The results are shown in table 10 below.
Table 10. Correlations of the Self-Efficacy and Mathematics Performance with Past Mathematics Performance

| Measure                     | Self-Efficacy | Current Mathematics Performance |
|-----------------------------|---------------|---------------------------------|
| SPM Mathematics             | 0.081         | 0.281**                         |
| SPM Additional Mathematics  | 0.146         | 0.479**                         |
| Matriculation Mathematics   | 0.328**       | 0.301**                         |
| Diploma Mathematics         | 0.180         | 0.261                           |

The result shows that past mathematics performance at secondary and Diploma do not have any impact towards self-efficacy. However, the performance of mathematics during matriculation can improve the students’ confidence level in integral calculus ($r = 0.328$, $p < 0.01$). Nevertheless, past performance correlates with current performance. This is shown from the significant correlation coefficient value for SPM Mathematics ($r = 0.281$, $p < 0.05$), SPM Additional Mathematics ($r = 0.479$, $p < 0.01$) and Matriculation Mathematics ($r = 0.301$, $p < 0.05$) with the score obtained for current mathematics performance. Surprisingly, the sample also shows that past mathematics performance during Diploma does not correlate with the integral calculus performance during Year 1 undergraduate.

3.5. Relationship between Self-efficacy and Mathematics Performance.

This study attempted to examine if the students’ mathematics performance is at par with their confidence towards mathematics, with respect to calculus. Do they think highly about themselves when it comes to mathematics or vice versa? To answer this statement, correlation analysis was carried out. The result is presented below in table 11. The statistics suggest that overall self-efficacy has no significant impact on performance in mathematics ($r = 0.154$, $p > 0.10$), as shown in figure 2. In other words, they were not correlated.

Table 11. Correlations of the Self-Efficacy and Mathematics Performance

| Measure                  | 1   | 2   |
|--------------------------|-----|-----|
| Self-Efficacy            | -   | 0.154|
| Mathematics Performance  | 0.154| -   |

Figure 2. A schematic diagram of the relationship
If the aspects of self-efficacy were to be examined individually to see if there was any significant impact towards mathematics performance, it can be seen from Table 12 that Techniques of integration ($r = 0.243$, $p < 0.05$) and Recognition of function ($r = 0.205$, $p < 0.05$) were significant and positively related to mathematics performance to some extent. The table also showed that self-efficacy is correlated with all of the aspects where the correlations values are as follows: Concept in Calculus ($r = 0.730$, $p < 0.01$), Translation from Concept to Formula ($r = 0.705$, $p < 0.01$), Techniques of integration ($r = 0.852$, $p < 0.01$) and Recognition of function ($r = 0.773$, $p < 0.01$). In other words, if the students understand the concept, techniques and the functions, their self-confidence will increase. However, they may improve their mathematics performance if they can improve their Techniques of integration and Recognition of functions.

**Table 12. Correlations of the Self Efficacy and Mathematics Performance with the all of the Aspects**

| Aspects                        | Self-Efficacy | Mathematics Performance |
|--------------------------------|---------------|-------------------------|
| 1 Concept in calculus          | 0.730**       | 0.007                   |
| 2 Translation from concept to formula | 0.705**       | -0.035                  |
| 3 Techniques of integration    | 0.852**       | 0.243*                  |
| 4 Recognition of functions     | 0.773**       | 0.205*                  |

*p < 0.05, ** p < 0.01

3.6. Predicting Mathematics Performance.

This study also aims to investigate the role of self-efficacy towards mathematics performance in integral calculus among Applied Science university students. Since the earlier part, it was found out that the association between self-efficacy and mathematics performance is insignificant, further investigation is to look at all four domains in self-efficacy questionnaires. Are any of these domains significant in predicting mathematics performance? Stepwise multiple regression was performed to accomplish this aim using all four aspects of self-efficacy as independent variables (predictors) and the score of their mathematics performance in integral calculus as the dependent variable.

Several assumptions include independence of the observations, normality, linearity and homoscedasticity were checked and were displayed in Figure 3.

The histogram and Normal P-P Plot showed that the residuals seem to be normally distributed around the mathematics performance scores. Plot of regression standardized residuals and regression standardized predicted values are randomly distributed suggesting that the homoscedasticity assumption is not violated. The residuals have constant variance. Lastly, the assumption on linearity is met through the linear relationship shown in the plot of the regression standardized residuals and dependent variable (mathematics performance scores).

The results in the stepwise multiple regression reveals that only one domain is significant. The only aspect in self-efficacy that can predict the mathematics performance is Techniques of integration. All other aspects are found to be insignificant. Therefore, they are excluded in the final model. Table 13 displays the estimation of the coefficients and its associated $t$ and $p$-value.

The model is statistically significant ($F = 5.999$, $p$-value = 0.016 < 0.05). Having confidence in the techniques of integration would account for 6% of the mathematics performance.
Figure 3. Diagnostics on the Regression Assumptions

Table 13. The Results of the Stepwise Multiple Regression Analysis for Mathematics Performance

| Model                     | B     | Std. error | Test statistics | Sig.  |
|---------------------------|-------|------------|-----------------|-------|
| Constant                  | 27.28 | 4.994      | 5.464           | 0.000*|
| Self-efficacy:            |       |            |                 |       |
| Techniques of Integration | 1.881 | 0.768      | 2.449           | 0.016*|

* Significant at 5%

3.7. Discussion.
These results show that there is different of self-efficacy level among matriculation students and Diploma students. The matriculation students are more confident with themselves in terms of solving the integration problem. Even though the Diploma students seem to be more confident in the concept and fundamentals, it is not enough for them to outperform their counterparts. This is shown with the significantly higher average marks scored by the matriculation students in all aspect of integral calculus. The average performance for both level of students is still at medium level with an average score of 42% (below 50%). While the students’ confidence level is different for different aspects of integral calculus, they sometimes underestimate their potential in solving the problem given. This is shown in the contradiction of ranking for their self-efficacy and the score obtained.
This study also finds out that high self-efficacy level does not guarantee high performance. The correlation coefficient is 0.154 and insignificant. These results contradict with many studies done by other researchers. However, deeper analysis on the relationship between these two variables revealed that the students need to improve their understanding and knowledge of the techniques in order to
improve their performance in integral calculus, the understanding and knowledge on the techniques has to be improved first. It is also important for the students to recognize the functions so that they can apply the correct techniques to solve the integration problems.

4. Results and Discussion

Currently, average Year 1 students at FSG were found to attain moderate self-efficacy with their mathematical abilities in Calculus. Since the matriculation and diploma students were exposed to different depths of Calculus in their syllabus, it is found that these exposures do not associate with their confidence in solving integral problem except for Matriculations Mathematics. Further investigation should be done to compare the students’ self-efficacy between these two groups.

Besides self-efficacy, their mathematics performance in Calculus was also examined. The results indicate that generally a student has moderate ability in Calculus, moderate ability in almost all aspects of Calculus and low ability for Translation from concept to formula.

In general, what the sample students think and what they actually scored with respect to Calculus were quite at par for Recognition of functions and Translation from concept to formula. Nevertheless, they were way beyond their expectation for Concept in calculus and Techniques of integration.

The findings from this study do not fully provide evidence to support the view that positive self-efficacy beliefs in mathematics increase mathematics performance since there was no significant impact on what the students perceive and what they score. However, understanding and have confidence in the techniques and how to apply them to solve integration problem would be a significant predictor in predicting the mathematics performance. It is also found out that past performance in mathematics has an association with current performance.

In reality, it is more meaningful to regress several independent variables towards a dependent variable. There were other factors such as personal and environmental variables that might influence the students’ mathematics performance. The faculty might investigate the benefits of owning books, learning environment, and internet access in the learning of mathematics. The results of this study help to evaluate and suggests strategies to be considered in order to improve the effectiveness of the current mathematics learning specifically at the faculty and the university as a whole.

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