



## Mathematical Dispositions of Graduating Students of the College of Engineering, University of Eastern Philippines (UEP)

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### Authors' contributions

This work was carried out in collaboration between both authors. Author LIM designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author BDV managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.

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## Abstract

This study was conducted to determine the mathematical disposition of graduating engineering students of the UEP College of Engineering in the School Year 2016-2017. Specifically, the study assessed the profile of the graduating students in terms of their age, sex, average grade in calculus and academic performance in professional subjects; the mathematical disposition in terms of self-efficacy component; math as sensible component; and perseverance component; the relationship between the profile and mathematical disposition of students, and between the mathematical disposition and academic performance in professional subjects of the respondents.

The 132 graduating students taking up Bachelor of Science in Agricultural Engineering (BSAE), Bachelor of Science in Civil Engineering (BSCE), Bachelor of Science in Electrical Engineering (BSEE), and Bachelor of Science in Mechanical Engineering (BSME) who are officially enrolled in the second semester of the school year 2016-2017 were the respondents of this study.

The study found out that there were more graduating engineering students whose age is beyond 22 to 24 years old; more males; and have passing performance in calculus subjects.

Generally, the graduating engineering students for the school year 2016-2017 have good mathematical disposition, specifically described as more efficacious, sensible, and more persevering.

The students' performance in calculus subjects was significantly related to mathematical disposition,

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while the age and sex of respondents have nothing to do with mathematical disposition. Specifically, respondents' age and sex did not affect the three components of mathematical disposition, while average grade in calculus subjects was found to have something to do with their sensibility and perseverance level in mathematics. On the relationship between mathematical disposition components and the academic performance in professional subjects of graduating engineering students, it was found out that only the math as sensible component affected their performance in professional subjects. The result of this study also revealed that these students who were more efficacious, more sensible and more persevering performed good in their professional subjects.

*Keywords: Mathematical disposition; self efficacy component; math as sensible component; perseverance component; UEP.*

## 1 Introduction

In mathematics classrooms every day, students learn valuable concepts that help them to be successful in their mathematical careers throughout their lives. This success includes success in the current classes they are taking, success in future mathematics classes, and success outside the context of schooling. Teachers hope that students will be able to take the important mathematical concepts that they have learned and apply them to future situations. This mathematical transfer of knowledge is vital to their future success especially in passing their respective board examination after completing their academic requirements in engineering courses. These are the things that engineering students must bear in mind while studying mathematics; they must possess a strong mathematical disposition.

Mathematical disposition refers to how the students respond to mathematical challenges, how they see themselves as learners of mathematics. It shows how much they are willing to persevere in attempting to analyse a problem, a procedure, a concept, or some other important aspects of mathematics and they are accumulating a set of good mathematical examples that they can use to help remember or reconstruct important ideas. In dealing with mathematics, particularly in Calculus, these things are always observed inside the classroom.

In the College of Engineering, calculus is one of the most important subjects in the curriculum. The subjects encountered by second year students are Differential Calculus in the first semester and Integral Calculus in the second semester. These subjects are considered as the "killer subjects" by the engineering students. Most of the students enrolled in these subjects encountered many difficulties in passing some quizzes and examinations conducted by their professors and instructors. Many of them dropped from the rolls or got failing grades at the end of the semester. This scenario can affect the students' performance on their professional courses as they continue on their study.

The data from the UEP Registrar's Office, from 2013 to 2016, revealed an average of 68% of students enrolled in Integral Calculus who dropped the subject. During the span of three academic years, there could be a higher variation of students' mathematical disposition as manifested by the average dropouts in calculus. This also happened in other countries wherein mathematical disposition of students were affected after taking calculus. A recent study by Whitney [1] found out that the fall semester may be just about over, but for too many calculus students, the relief of being done with finals is tempered by a loss in math confidence especially if they are female.

Pajares and Miller [2] claimed that students' beliefs about their own problem solving abilities had a significant effect upon problem-solving performance, with higher self-efficacy about their problem solving leading to better performance in problem solving tasks, and lower self-efficacy about problem solving leading to lower performance. In fact, students with the same mathematical skills can vary vastly in their ability to use those skills based only on their self-efficacy beliefs.

Shunk and Pajares [3] pointed out that, although the Self-Efficacy Component do have influence on students' beliefs about the importance of hard work and perseverance in mathematics and mathematical problem solving, it is conceivable that a student could have a high level of self-efficacy but still very strongly believe that success in mathematics comes mostly from innate ability. Thus, the Math as Sensible and the Perseverance components still need to be looked at separately within a students' mathematical disposition. Furthermore, those who firmly believe that math is sensible and perseverance is a key for mathematical success, such as those with a productive disposition, when inevitably encountering difficulties with mathematics, are more likely to persist and endure through hardships and be successful in future mathematical studies and careers [4].

In this situation, the researcher believe there is a need to document the mathematical disposition of graduating students in the college of engineering in order to find out whether the said calculus subjects influenced their mathematical disposition and if this disposition helped them to improve their performance on their professional subjects that could help them in passing the licensure examination and becoming successful engineers in the near future.

The researcher conducted this study to determine the mathematical dispositions of graduating students and their academic performance in the College of Engineering University of Eastern Philippines-Main Campus. Specifically, it aimed to: (1) determine the profile of graduating engineering students for the school year 2016-2017 in terms of age, sex, and average grade in calculus subjects; (2) assess the level of mathematical disposition of students in terms of self-efficacy component, math as sensible component, and perseverance component; (3) determine the academic performance of the respondents in professional subjects; (4) point out the relationship between the mathematical disposition and students' profile; and (5) find out the relationships between mathematical disposition and academic performance in professional subjects of graduating students in the college of engineering.

## **2 Methodology**

This study was conducted at the College of Engineering, University of Eastern Philippines, in Catarman, Northern Samar. The College of Engineering offers four (4) engineering courses namely: Bachelor of Science in Agricultural Engineering (BSAE), Bachelor of Science in Civil Engineering (BSCE), Bachelor of Science in Electrical Engineering (BSEE), and Bachelor of Science in Mechanical Engineering (BSME). These four engineering courses are completed in five years. The first two years are confined to general education courses/subjects like Algebra, Trigonometry, Geometry, Differential and Integral Calculus, Chemistry, English, Filipino, Physical Education, and General Sociology.

In this study, the researcher used the descriptive correlational research method through a survey questionnaire to find out mathematical disposition of graduating students in the College of Engineering for the school year 2016-2017. The correlational study was employed for the purpose of finding out the relationship of the profile and mathematical disposition and the relationship of mathematical disposition and academic performance of the respondents.

This study had two main variables: the independent variables composed of the profile in terms of age, sex, and average grade in calculus subject; and the dependent variables which are the mathematical disposition components and academic performance in professional subjects of engineering students.

All graduating students from the four (4) engineering courses of the UEP-CE who are officially enrolled this second semester of SY 2016-2017 were considered respondents of this study. There were 132 candidates for graduation for the School Year 2016-2017 from the College of Engineering, of which four (4) are BS Agricultural Engineering, 48 BS Civil Engineering, 57 BS Electrical Engineering, and 23 BS Mechanical Engineering.

In gathering the data for this study, The researcher’s questionnaire was anchored on the research conducted by Watson [5] which listed forty five (45) statements aimed at measuring the self-efficacy; math as sensible; and perseverance components of a mathematical disposition. The questions were pulled directly from the Fennema-Sherman Confidence in Learning and Usefulness of Mathematics Scale and Indiana Mathematics Belief Scales, giving a mixed parity of the statements, with about one-fourth of the statements worded negatively and the rest worded positively. All of the survey statements, including the parity of each statement, were found in the questionnaire.

The first part of the survey questionnaire gathered the data on respondent’s age, sex, and average grade in calculus subjects. The grades of the respondents were obtained from the registrar’s office. The second part of the survey questionnaire covered the mathematical disposition survey composed of forty five (45) items aimed at measuring the self-efficacy, math as sensible, and the perseverance components of the respondents.

Collected data on the first part of the questionnaire were tallied and averaged to get the means and percentages. The average final grade in calculus and grade point average grade in professional subjects were categorized using the UEP grading system wherein 1.0 is classified as excellent, 1.25 and 1.50 classified as very good, 1.75, 2.0, and 2.25 classified as good, 2.5 and 2.75 classified as fair and 3.00 as passed.

A five-point Likert Scale was used to convert the qualitative responses of respondents on the statements about mathematical disposition on the second part of the questionnaire into quantitative data (score), as follows:

<u>Response</u>	<u>Score</u>
Strongly Agree	5
Agree	4
Undecided	3
Disagree	2
Strongly Disagree	1

To measure the self-efficacy component of graduating students in the College of Engineering, their responses were categorized and averaged and the average value was interpreted as follows:

<u>Range</u>	<u>Description</u>
4.20 – 5.00	Most Efficacious
3.40 – 4.19	More Efficacious
2.60 – 3.39	Efficacious
1.80 – 2.59	Less Efficacious
1.00 – 1.79	Least Efficacious

To measure the math as sensible component of graduating students, their responses were categorized and averaged and the average value was interpreted as follows:

<u>Range</u>	<u>Description</u>
4.20 – 5.00	Most Sensible
3.40 – 4.19	More Sensible
2.60 – 3.39	Sensible
1.80 – 2.59	Less Sensible
1.00 – 1.79	Least Sensible

Likewise, to determine the perseverance component of graduating students in the College of Engineering, their responses were categorized and averaged and the average value was interpreted as follows:

<u>Range</u>	<u>Description</u>
4.20 – 5.00	Most Persevering
3.40 – 4.19	More Persevering
2.60 – 3.39	Persevering
1.80 – 2.59	Less Persevering
1.00 – 1.79	Least Persevering

The gathering of data needed for the completion of the study started when the researcher obtained approval for the conduct of this study from the Dean, College of Engineering, the department chairmen and the faculty. He also asked permission from the students who will serve as the respondents of the study. Then, the researcher coordinated with the dean and the department heads for their assistance in the distribution as well as the retrieval of the questionnaire. The questionnaires were distributed. Answers on the retrieved questionnaires were encoded and tallied using MS Excel.

The data gathered were summarized and further analysed. Frequency counts and percentages were used to group the data in determining the respondent's profile. To determine the mathematical disposition of graduating students in the College of Engineering, the arithmetic mean was employed. To find out if there is significant relationship between the dependent and independent variables, the multiple regression analysis and chi-square test were used.

**Statistical Treatment:** The data gathered were treated and further analysed using the following statistical procedures to come up with the desired analysis.

Frequency counts and percentages were used to group the data in determining the respondent's profile.

To determine the mathematical disposition of graduating students in the College of Engineering, the arithmetic mean was employed. It also presented descriptive ratings and described mathematical disposition as perceived by the respondents. It was likewise used when the coefficient of correlation was computed.

To find out the significant relationship between the dependent and independent variables, multiple regression analysis and chi-square test were used.

## 3 Results and Discussion

### 3.1 Profile of the respondents

**Age:** Table 1a presents the distribution of the respondents according to age. The table revealed that out of 132 respondents, 67 or 50.76% were of 22-24 years old, 56 or 42.42% were 19-21 years old, and only 9 or 6.82% were 25-27 years old. This means that most of the respondents had the right age in accordance with their year level wherein a fifth year student should be a 22-24 years old.

**Sex:** Table 1b reveals that there were 93 (70.45%) males and 39 (29.55%) females. It shows that most of the respondents were males. This implies that more male students prefer to enrol and finish an engineering course; thus, the College of Engineering is still dominated by male students.

**Average Grade in Calculus:** Table 1c presents the distribution of respondents according to their performance in the calculus subjects. The data show that out of 132 respondents, 75 or 56.8% merely passed the subject while 34 or 25.8%, 20 or 15.2%, and 3 or 2.3% have fair, good and very good performance, respectively. This means that most of the students involved in this study could barely pass the subjects. This

implied that most of the students have struggled in passing the calculus subjects which could mean that their knowledge and skills in basic engineering mathematics were deficient.

**Table 1a. The frequency distribution of respondents by age**

Age Bracket	Frequency	Percentage
19 – 21	56	42.42
22 – 24	67	50.76
25 – 27	9	6.82
Total	132	100

**Table 1b. The frequency distribution of respondents by sex**

Sex	Frequency	Percentage
Male	93	70.50
Female	39	29.50
Total	132	100

**Table 1c. The frequency distribution of the average grade in calculus of the respondents**

Average Grade	Description	Frequency	Percentage
1.25	Very Good	3	2.30
1.50			
1.75	Good	20	15.20
2.00			
2.25			
2.50	Fair	34	25.80
2.75			
3.00	Passed	75	56.80
Total		132	100.00

### 3.2 Mathematical disposition of the respondents

**Self Efficacy Component:** Table 2a shows that the graduating engineering students this school year 2016-2017 were more efficacious as indicated by the grand mean rating of 3.44.

Majority of the respondents strongly believed that they can use mathematics in their career when needed and that they are confident they have learned the basic concepts taught in math as manifested by the mean rating of 4.48 and 4.07 which were interpreted as most efficacious and more efficacious, respectively. This means that these students believe they be able to utilize what they learned in mathematics in their engineering profession and that they are assured they have knowledge on some basic mathematical concepts taught in mathematics. However, the table also revealed that few of the respondents did not believe that they were unable to grasp the concepts taught in mathematics and that they have done advanced mathematics as evidenced by the mean rating of 2.01 and 2.46 interpreted as less efficacious and efficacious, respectively. This means that these students possessed a positive disposition towards mathematics studies.

**Table 2a. Mathematical disposition in terms of self efficacy component of respondents**

Statement	Mean	Interpretation
I believe I can use mathematics in my future career when needed	4.48	Most Efficacious
I am confident I have learned the basic concepts taught in math	4.07	More Efficacious
I am sure that I have learned mathematics	4.05	More Efficacious

Statement	Mean	Interpretation
I believe I have learned well in a mathematics course	3.84	More Efficacious
I am sure I can do advanced work in mathematics	3.83	More Efficacious
I imagined myself working through challenging math problems successfully	3.81	More Efficacious
I think I have handled more difficult mathematics	3.57	More Efficacious
I believe I have completed all of the assignments in a mathematics course	3.50	More Efficacious
I believe I have done well on a mathematics test	3.45	More Efficacious
I believe I am the type of person who have done well in mathematics	3.33	Efficacious
I was able to get good grades in mathematics	3.27	Efficacious
I had difficulties on mathematical formula memorization	3.19	Efficacious
I am incapable of solving difficult mathematical problem	2.72	Efficacious
I don't think I have done advanced mathematics	2.46	Efficacious
I was unable to adapt knowledge gained in mathematics	2.01	Less Efficacious
<b>Grand Mean</b>	<b>3.44</b>	<b>More Efficacious</b>

**Table 2b. Mathematical disposition in terms of math as sensible component of respondents**

Statement	Mean	Interpretation
In addition to getting a right answer in mathematics, it is important to understand why the answer is correct	4.57	Most Sensible
I study mathematics because I know how useful it is	4.55	Most Sensible
I will need mathematics for my future work	4.33	Most Sensible
Mathematics is a worthwhile and necessary subject	4.32	Most Sensible
I will use mathematics in many ways in engineering profession	4.30	Most Sensible
Mathematics is enjoyable and stimulating to me	4.04	More Sensible
Time used to investigate why a solution to a math problem works is time well spent	4.03	More Sensible
I have seen mathematics as a subject that I will rarely use in my daily life in engineering profession	3.32	Sensible
Getting a right answer in math is more important than understanding why the answer works	2.50	Less Sensible
There is nothing creative about mathematics; it's just memorizing formulas and numbers	2.06	Less Sensible
It doesn't really matter if you understand a math problem if you can get the right answer	2.02	Less Sensible
It's not important to understand why a mathematical procedure works as long as it gives a correct answer	1.88	Less Sensible
Mathematics is of no relevance to my life	1.55	Least Sensible
Mathematics will not be important to me in my life's work	1.52	Least Sensible
Studying mathematics is a waste of time	1.25	Least Sensible
<b>Grand Mean</b>	<b>3.08</b>	<b>Sensible</b>

**Table 2c. Mathematical disposition in terms of perseverance component of the respondents**

Statement	Mean	Interpretation
Hard work can increase one's ability to do math	4.64	Most Persevering
By trying hard, one can become smarter in math	4.51	Most Persevering
I can get smarter in math if I try hard	4.37	Most Persevering
Participating in problem solving activities in math class can improve one's ability in mathematics	4.32	Most Persevering
I can get smarter in math by trying hard	4.30	Most Persevering
Ability in math increases when one studies frequently	4.26	Most Persevering
A person who doesn't understand why an answer to a math problem is	4.02	More Persevering

Statement	Mean	Interpretation
correct hasn't really solved the problem		
I feel I can do math problems that take a long time to complete	3.76	More Persevering
I'm not very good at solving math problems that take a while to figure out	3.52	More Persevering
Math problems that take a long time don't bother me	3.27	Persevering
I found out I can do hard math problems if I just hang in there	3.20	Persevering
Mathematics makes me feel uneasy and confused	2.96	Persevering
If I can't do a math problem in a few minutes, I probably can't do it at all	2.24	Less Persevering
If I can't solve a math problem quickly, I quit trying	2.22	Less Persevering
I have never liked mathematics, and it is my most dreaded subject	1.77	Least Persevering
<b>Grand Mean</b>	<b>3.56</b>	<b>More Persevering</b>

**Math as Sensible Component:** Table 2b shows the responses of the respondents on mathematical disposition considering math as a sensible component. The table revealed that the respondents were sensible towards mathematics as evidenced by the grand mean rating of 3.08.

Many of these students believed that in arriving the right answer to mathematics problem, it is important to understand why the answer is correct and that they studied mathematics because they know how useful it is as manifested by the mean rating of 4.57 and 4.55, respectively, interpreted as most sensible. This implies that the students understood the degree to which mathematics is sensible, useful, and worthwhile and that they were able to apply their knowledge in mathematics in their daily lives as engineering students. On the other hand, the table reveals that few of them did not believe that studying mathematics is a waste of time and that it will not be important to their life's work as indicated in the mean rating of 1.25 and 1.52, respectively, interpreted as least sensible. Further, the respondents firmly believed the importance of mathematics to their life and career.

**Perseverance Component:** Table 2c shows the responses of the respondents on mathematical disposition considering the perseverance component. It can be seen that graduating engineering students were more persevering as indicated by the grand mean rating of 3.56.

These students understood that working hard can increase one's ability and trying hard can make one smarter in math as manifested by the mean rating of 4.64 and 4.51, respectively, interpreted as most persevering. This means that some of the respondents strongly believe that in order to become successful in mathematics courses, they need to invest time and efforts through constant problem. However, few of them considered mathematics to be the most dreaded subject and patience is important while solving mathematics problem as evidenced by mean ratings of 1.77 and 2.22 interpreted as least and less persevering, respectively. This means that many of them believed diligence and persistence are important values in dealing with mathematics.

### 3.3 Academic performance of respondents on their respective professional subjects

Professional subjects refer to the fundamental and major subjects of graduating engineering students included in the curriculum outline of their respective Commission on Higher Education (CHED) Memorandum Order (CMO). These subjects contain planning, designing and construction topics.

#### Grade Point Average (GPA) of the Respondents in their Professional Subjects:

Table 3 presents the distribution of the respondents according to their grade point average in their professional subjects. The data reveal that out of 132 respondents, 82 or 62.10% performed good in their professional subjects, 49 or 37.10% performed fairly, and only 1 or 0.80% performed very good.

Generally, the graduating engineering students for the school year 2016-2017 performed good in their professional subjects as manifested in the overall GPA of 2.25 with a descriptive equivalent of good. This



means that these students have a good performance in the application of their knowledge in mathematics in their professional subjects which contains planning, design and construction topics.

**Table 3a. The grade point average of the respondents in professional subjects**

Average Grade	Description	Frequency	Percentage
1.25	Very Good	1	0.80
1.50			
1.75		82	62.10
2.00	Good		
2.25			
2.50	Fair	49	37.10
2.75			
Total		132	100.00

### 3.4 Relationship between the profile of the respondents and their mathematical disposition

Table 4 presents the Multiple Regression Analysis between the mathematical disposition and profile of the respondents revealed that the average grade in calculus of the graduating engineering students is significantly related to their sensibility in mathematics as well as their perseverance level. This means that their performance in calculus subjects really affected their mathematical disposition as they continue their engineering studies. This finding is in agreement with study of Whitney [1] which concluded that mathematical disposition was affected by calculus.

However, the respondent's age and sex have nothing to do with their mathematical disposition as manifested by their respective significant value. The result is not in conformity with the study of Hall [6] which concluded that age and gender play a significant role in the development and stability of a students' positive mathematical disposition. But this conforms to the findings of Patterson et al. [7] and Nicolaidou [8] which found out that gender has nothing to do with disposition in mathematics.

**Table 4. Summary result of the correlation between respondents' profile and their mathematical disposition**

Profile	Parameters	Mathematical Disposition		
		Self-Efficacy	Math as Sensible	Perseverance
Age	Pearson Correlation	0.114	0.135	0.038
	Sig. (2-tailed)	0.096	0.061	0.332
	Interpretation	Not Significant	Not Significant	Not Significant
Sex	Pearson Correlation	0.004	-0.077	-0.107
	Sig. (2-tailed)	0.483	0.190	0.111
	Interpretation	Not Significant	Not Significant	Not Significant
Average Grade in Calculus	Pearson Correlation	0.025	0.145	0.203
	Sig. (2-tailed)	0.390	0.048	0.010
	Interpretation	Not Significant	Significant	Significant

### 3.5 Relationship between the mathematical disposition and academic performance in professional subjects of the respondents

Table 5 presents the results of cross tabulation and correlation table generated using Chi-square Test between the mathematical disposition components of the respondents and the grade point average in professional subjects revealed that only the math as sensible component significantly affected the academic performance of respondents in professional subjects.

On self-efficacy component, majority of the graduating engineering students who were more efficacious performed good in professional subjects. The chi-square test results revealed that the self-efficacy component has nothing to do with their performance in professional subjects which is in contrast with the findings of Loo et al. [9].

On math as sensible component, majority of the graduating engineering students who were more efficacious performed good in professional subjects. The chi-square test results indicated that most of the students, sensible to mathematics, performed good in professional subjects. This means that sensibility of students in mathematics had something to do with their performance in professional subjects and there is a significant relationship between the math as sensible component and the academic performance in professional subjects.

On perseverance component, the chi-square test results indicated that those students who were more persevering performed good in professional subjects. However, in general, the perseverance level of respondents had nothing to do with their performance in professional subjects. This implies that no significant relationship between the perseverance level of students and academic performance in professional subject is reflected.

**Table 5. Cross tabulation and correlation table of respondents' mathematical disposition components and grade point average in professional subjects**

Mathematical Disposition	Category	GPA in professional subjects				Pearson Chi Square	Sig. (2 tailed)	Interpretation
		Very Good	Good	Fair	Total			
Self-Efficacy	Efficacious	0	38	18	56	2.668	0.615	Not Significant
	More Efficacious	1	43	31	75			
	Most Efficacious	0	1	0	1			
	Total	1	82	49	132			
Math as Sensible	Sensible	0	76	39	115	11.501	0.003	Significant
	More Sensible	1	6	10	17			
	Total	1	82	49	132			
Perseverance	Persevering	0	19	6	25	2.723	0.605	Not Significant
	More Persevering	1	62	42	105			
	Most Persevering	0	1	1	2			
	Total	1	82	49	132			

## 4 Conclusions and Implications

The following conclusions and implications were drawn from the findings of the study.

In the assessment of students' mathematical disposition, it was concluded that majority of the students are more efficacious, sensible, and more persevering towards mathematics. It implies that these engineering students believed in their capability of using mathematics effectively and successfully; they believed about the degree in which mathematics is sensible, useful, and worthwhile; and they believed the importance of persistence and diligence in attaining success in solving mathematical problems.

On the relationship of graduating engineering students' profile and mathematical disposition, it was concluded that their age and sex have nothing to do with their mathematical disposition. It implies that these factors did not affect the students' disposition towards mathematics. On the other hand, their performance in calculus subjects has something to do with their sensibility and perseverance level in mathematics. It further implies that students' performance in calculus subjects affects their persistence and diligence in solving

mathematics problem as well as on their belief that mathematics is useful, sensible and worthwhile as they continue on their engineering studies.

On the relationship of mathematical disposition to the academic performance in professional subjects, it was concluded that those students who were more efficacious, sensible and more persevering in mathematics performed good in their professional subjects. However, the only factor that affected their grade point average in professional subjects was the sensible component. This implies that the sensibility level of these students is directly related to their performance in professional subjects. It means that when they believed that mathematics is useful, sensible and worthwhile, they also improved in their engineering studies.

## Competing Interests

Authors have declared that no competing interests exist.

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