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Identifying factors that affected student enrolment in Additional Mathematics for urban areas of Kuantan district

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Abstract. The skilful and qualified Science, Technology, Engineering and Mathematics (STEM) workforces are expected to be in high demand in the 21st digital economy. In Malaysia public education system, the principal key to STEM education is Additional Mathematics. However, the statistics depicted that the number of upper secondary students enrolled in Additional Mathematics have been severely delineated. Furthermore, the prerequisite to enrol in STEM and Technical and Vocational Education and Training (TVET) courses in tertiary education is achieving a minimum grade C for Additional Mathematics. Therefore, the principal objective of this article is to identify the significant factors that affected the upper secondary students enrolled in Additional Mathematics using Pearson's chi-square test without Yates continuity correction and unadjusted odds ratio (OR). A validated questionnaire comprised nine potential factors that affected enrolment in additional mathematics was distributed to 389 Form Four students' cohort 2020 from four selected urban government schools to pursue this objective. Based on the finding of this article, several initiatives might be taken by the policymakers, such as the teachers may enhancing and throughout the broad of STEM and TVET careers in the 21st digital economy era, while the students' parents can participate in schools in building the communicating and coordinating mechanism. Consequently, the number of upper secondary enrolled in STEM education might be increased to pipeline the future STEM and TVET human capitals in sustaining and stabilising the national economy in the digital era.

1. Introduction

The first National Science and Technology Enrolment Policy, namely 60:40 Science: Arts policy, has been implemented in Malaysia's upper secondary education since 1970 [1,2]. In particular, this policy's principal objective is to provide the qualified and skilful Science, Technology, Engineering and Mathematics (STEM) workforces highly demanded in the future job market to ensure the sustainability and stability of the national economy in the 21st-century digital era [3,4]. For instance, the Academy of Sciences Malaysia outlined that the nation needs about one million new STEM human capitals in 2020. Despite that, the National Science and Technology Enrolment Policy remains unattainable [1-6].

Several studies have investigated the key factors affecting the upper secondary students' interest in a STEM career to overcome the issue mentioned above. In Malaysia, Razali et al. [3] conducted a study to identify the factors that affected the Form Four Science Stream students' interest in STEM careers for the Selangor State, in which the sample was selected using a multistage cluster sampling technique. Their study concluded that attitude, motivation and parental influence are the key factors to inculcate the students' interest in STEM careers. Meanwhile, Shahali et al. [8] conducted a longitudinal study to determine the effectiveness of the integrated program on students' interest in STEM. They selected the lower secondary students in Peninsular Malaysia who achieved grade A in Science and Mathematics during the Primary School Achievement Test (*Ujian Pencapaian Sekolah Rendah*, UPSR) using a stratified sampling technique. Their finding concluded that decreasing students' interest in STEM could be due to the quality of teaching and learning in their classrooms.

Recently, Tey et al. [4] research the significance of parental, teacher and peer influences affective the students towards the STEM interest and career among the Form Four students from the central region of Peninsular Malaysia such as Kuala Lumpur, Putrajaya and Selangor. They employed the proportionate stratified sampling technique in selecting the sample. Their empirical study found that parental influence is the significant factor affective the students' interest and career selection towards STEM, while parental and peer influences are the significant factors affecting the students towards the STEM career. However, the teacher influence is insignificant affective the students' interest and career selection towards STEM. In contrast, Razali et al. [9] conducted a study to identify the significant motivational factors such as self-efficacy, self-determination, career, intrinsic motivation and grade in inculcating the students' interest in a STEM career. In pursuing their primary objective, the insights of motivational factors have been collected from the Form Four Science Stream students in Selangor State using the 10-point Likert scale questionnaire. In this study, they also employed the proportionate stratified sampling technique in selecting the sample. The analysis results show that these motivational factors significantly affected the upper secondary students' interest in STEM careers.

On the other hand, the socioeconomic status (SES) affects the students' interest to enrol in STEM education also have been taken into account in the worldwide educational research. For instance, Chachashvilin-Bolotin et al. [10] studies the factors affecting the secondary students' interest enrols in tertiary STEM education in Ashdod Israel. Their finding shows that gender, mathematics achievement, educational discipline and STEM extra-curricular activities are the significant factors that affect the secondary student's interest in tertiary STEM education. Meanwhile, Niu [11] also conducted a study to identify the significant SES affective the students' enrolled in colleges' STEM education for the United States national level. Their study found that gender, ethnicity, mathematics achievement, receiving privileges for a good grade and high school socioeconomic status are the significant factors affecting student enrolment in STEM education. Moreover, there are several studies in the western nations such as United States [11], Australia [12] and the Netherlands [13] which show that the lower family's SES in which reflected the lower parental education and family income, had affected the students enrolled in the STEM education and career.

The principal objective of this study is to identify the significant factors affecting the upper secondary students in urban areas of the Kuantan District enrolled in Additional Mathematics using unadjusted odds ratio (OR), without taking into account the effects due to the confounding variables. Mathematics such as Additional Mathematics in Malaysia's public education system, is the key subject for STEM education and careers [14-17]. To pursue the objective, this study employed nine potential factors acquired from the previous studies. There are including five socioeconomic status (SES) (gender, household income, educational discipline, parental education level, and PT3 Mathematics achievements), one intrinsic (self-efficacy) and three extrinsic (teacher influence, parental influence and peer influence) motivational factors. The rest of this article is organised as follows. In Section 2, the methodology of sampling and data collection and a brief overview of the theoretical background for the Pearson's chi-square test without Yates continuity correction and OR are presented, while the empirical results of the analysis are given in Section 3. Finally, the discussion and conclusions are presented in Section 4.

2. Methodology

This section provides a brief overview of the methodology for data collection and data analysis. The insights collected from the selected sampling units via survey questionnaire were self-reported, and the collected data set was analysed using Microsoft Excel 2019 and SPSS Version 23. The methodology of this study has two major stages: the first stage (subsection 2.1) is the sampling and data collection, while the second stage (subsection 2.2) is the data analysis.

2.1. Sampling and data collection

Since the previous fully adapted Integrated Secondary School Curriculum (*Kurikulum Bersepadu Sekolah Menengah*, KBSM) for all subjects on the secondary education in 1989 is ineffective to provide the human capitals that meet the needs of workforces in the 21st century digital era [4]. Therefore, the Ministry of Education (MOE) has revised and implemented a new revised Standard Based Curriculum (*Kurikulum Standard Sekolah Menengah*, KSSM) in 2017 from Form One. The aim is to guide students towards the Science, Technology, Reading, Arts and Music (STREAM) education system to produce more STEM-literate students that meet the future job market needs [4-5]. In other words, the targeted population involved in this study is all the potential Form Four student's cohort 2020 from the urban areas of Kuantan District, the first cohort upper secondary students enrolled in Additional Mathematics using the KSSM syllabus. Due to time and cost constraints, this study has selected 389 Form Four students from four distinct urban national secondary schools from the areas using the cluster sampling technique. The geographical insights corresponding to the four selected schools are presented in figure 1 and table 1.

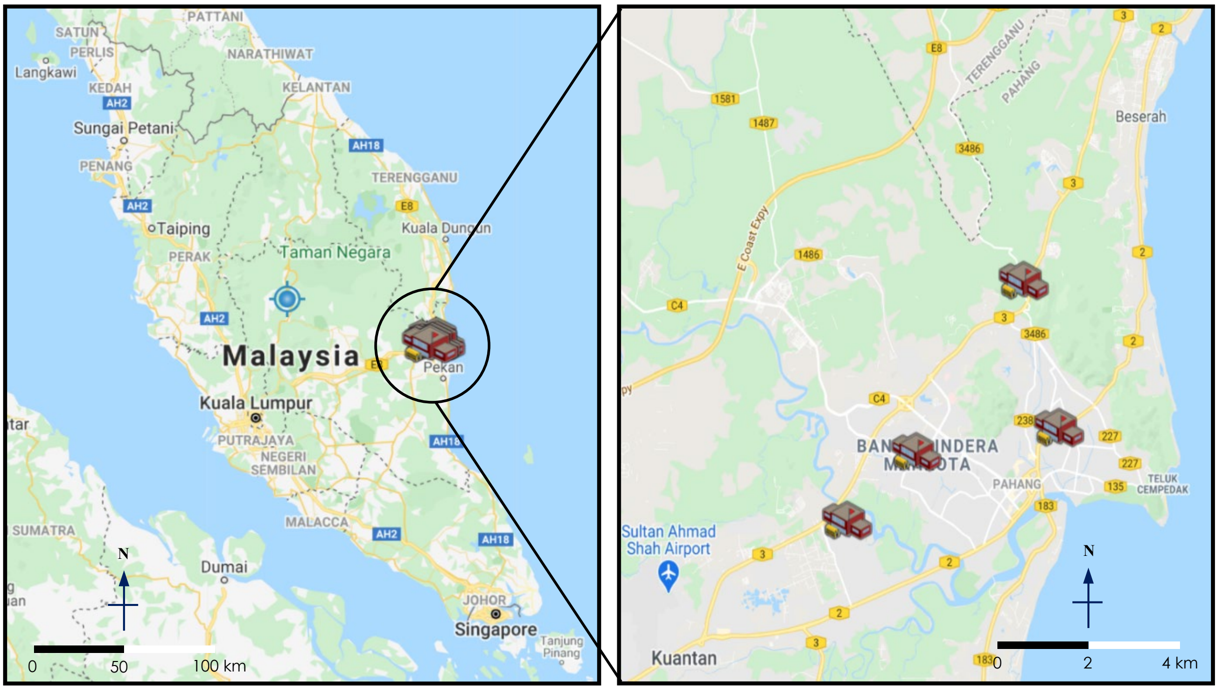

Figure 1. Locations of the four selected urban public secondary schools in Kuantan District.

Table 1. The geographical information of the four selected urban public secondary schools in Kuantan Districts.

School	School name	Latitude (°N)	Longitude (°E)	Sub-sample size
1	SMK Air Putih	3˚49'43"	103˚20'20"	156
2	SMK Bukit Rangin	3˚48'08"	103˚16'18"	115
3	SMK Semambu	3˚52'12"	103˚19'40"	50
4	SMK Tg. Panglima Perang Tg. Muhammad	3˚49'18"	103˚17'37"	68

*Note: SMK = Sekolah Menengah Kebangsaan (National Secondary School).

In addition, the sample size employed meets the required minimum sample size, n_{min}, which was computed using Yamane's equation as given in equation (1).

$$n_{\min} = \frac{N_a}{N_a \varepsilon^2 + 1} \quad (1)$$

where $N_a = 3215$ represents the population size for all Form Four students' cohort 2020 from Kuantan District, while $\varepsilon = 0.05$ represents the sampling error. Moreover, the main reason for using the cluster sampling technique is to capture the heterogeneous effects due to the distinct subject packages offered among the secondary schools and teaching approaches among the teachers.

A new 5-point Likert scale survey questionnaire was developed for data collection by re-designing the existing survey questionnaire in the previous educational studies [18-20]. A pilot study was conducted to consolidate the reliability of the developed survey questionnaire. The results of analysis for the pilot study shows that the Cronbach's alpha measurement of all four intrinsic (self-efficacy: 0.929) and extrinsic (teacher influence: 0.854; parental influence: 0.923; peer influence: 0.885) motivational factors are greater than 0.7, which means the reliability of the new set of the survey questionnaire is accepted. Henceforth, a full-scale study was conducted using the validated survey questionnaire on the 389 selected Form Four students in urban areas of the Kuantan District between mid-February and mid-March before the implementation of the Malaysian Government Movement Control Order (MCO) 2020.

2.2. Data analysis

In this study, all the collected data from the 389 selected samples is complete and used. Suppose that $\mathbf{X} = \left[x_{ij} \right]_{M \times N}; i, (j) = 1, 2, \ldots, M, (N)$ represents a $M \times N$ matrix comprises $M = 389$ samples and $N = 11$ attributes, including the information in the enrolment of the Form Four students in Additional Mathematics, denoted as $\mathbf{X}_1$. Furthermore, $\mathbf{X}_1$ can be partitioned into two sub-categories, $O_b; b = 1, 2$. In particular, O_1 and O_0 respectively represent the enrolee and non-enrolee in Additional Mathematics. Meanwhile, $\mathbf{X}_j; j \neq 1$ can also be partitioned into $C \geq 2$ sub-categories, denoted as $E_c; c = 1, 2, \ldots, C$. Therefore, the insights of $\mathbf{X}_1$ corresponding to each $\mathbf{X}_j$ can be summarised using the $2 \times C$ two-way contingency table as follows:

Table 2. The $2 \times C$ two-way contingency table of $\mathbf{X}_1$ corresponding to each $\mathbf{X}_j$.

$\mathbf{X}_1$	$\mathbf{X}_j$				**Total**
	E_1	E_2	$\cdots$	E_C	
O_0	f_{01}	f_{02}	$\cdots$	f_{0C}	$f_{0\cdot} = \sum_{c=1}^{C} f_{0c}$
O_1	f_{11}	f_{12}	$\cdots$	f_{1C}	$f_{1\cdot} = \sum_{c=1}^{C} f_{1c}$
Total	$f_{\cdot 1} = \sum_{b=0}^{1} f_{b1}$	$f_{\cdot 2} = \sum_{b=0}^{1} f_{b2}$	$\cdots$	$f_{\cdot C} = \sum_{b=0}^{1} f_{bC}$	M

where f_{bc} represents the observed frequency between the sub-categories O_b and E_c. Based on table 2, the significant association between $\mathbf{X}_1$ and $\mathbf{X}_j$ is determined using the Pearson's chi-square test without Yates continuity correction, χ^2_{test}. In particular, the χ^2_{test} measures the discrepancy between the observed and the expected $\left(e_{bc}\right)$ frequencies, given as

$$\chi^2_{test} = \sum_{b=1}^{2} \sum_{c=1}^{C} \frac{\left(f_{bc} - e_{bc}\right)^2}{e_{bc}} \tag{2}$$

where $e_{bc} = \frac{f_{\cdot b} \cdot f_{c\cdot}}{M}$ and χ^2_{test} asymptotically approaches to the χ^2 distribution with degree of freedom $C-1$. In general, the e_{bc} is frequently assumed to be ≥ 5 in approaching the χ^2 distribution. The combination of sub-categories is true if the assumption does not satisfy [21]. Consequently, the *p*-value of χ^2_{test} is computed using equation (3).

$$p\text{-value} = \frac{\gamma\left(\frac{C-1}{2}, \frac{\chi^2_{test}}{2}\right)}{\Gamma\left(\frac{C-1}{2}\right)} \tag{3}$$

in which $\gamma\left(\frac{C-1}{2}, \frac{\chi^2_{test}}{2}\right) = \int_{\frac{\chi^2_{test}}{2}}^{\infty} \theta^{\frac{C-3}{2}} \exp(-\theta)\, d\theta$ is the upper incomplete gamma function and $\Gamma\left(\frac{C-1}{2}\right) = \left(\frac{C-3}{2}\right)!$. There is a significant association between $\mathbf{X}_1$ and $\mathbf{X}_j$ if and only if *p*-value < 0.05. Since the Pearson's chi-square without Yates continuity correction test can merely present the significant association between the two attributes, this study has further analysed the strengths of the association between $\mathbf{X}_1$ and $\mathbf{X}_j$ using OR, which is computed using equation (4).

$$\mathrm{OR}=\frac{f_{0c}/f_{1c}}{f_{0C}/f_{1C}};\ c\neq C \tag{4}$$

where E_C is the reference sub-category with the lowest odds of enrolment in Additional Mathematics, and the p-value(OR) $=2-2\cdot\Phi^{-1}\left(\frac{\ln(\mathrm{OR})}{\sqrt{\frac{1}{f_{0c}}+\frac{1}{f_{0C}}+\frac{1}{f_{1c}}+\frac{1}{f_{1C}}}}\right)$ in which $\Phi^{-1}(\cdot)$ represents the quantile function of the standard normal distribution. The corresponding 95% confidence interval (C.I.) for the OR is given as

$$\exp\left(\ln(\mathrm{OR})\pm 1.96\sqrt{\frac{1}{f_{0c}}+\frac{1}{f_{0C}}+\frac{1}{f_{1c}}+\frac{1}{f_{1C}}}\right) \tag{5}$$

In general, $\mathbf{X}_j$ does not significantly affect the odds of $\mathbf{X}_1$ when the $\mathrm{OR}=1$ with the p-value (OR) ≥ 0.05, and the corresponding 95% C.I. of the OR does overlap with the hypothesised value of $\mathrm{OR}=1$. In contrast, $\mathbf{X}_j$ associated with significant higher odds of $\mathbf{X}_1$ when the OR > 1 with the p-value (OR) < 0.05, and the corresponding 95% C.I. of the OR does not overlap with the hypothesised value of OR $=1$, which the lower and upper limits for the 95% C.I. of the OR are customarily >1. In other words, the Form Four student with the attribute $E_c; c\neq C$ has a significant higher tendency to enrol in Additional Mathematics compared to the student with the attribute E_C in which both the attributes E_c and E_C belonged to the similar main factor investigated in this study.

3. Results of analysis and discussion

In this article, we rescaled the household incomes attribute by combining the proximity sub-categories to fit the household income classification 2019 of the Pahang state, namely B40 (< RM3,900), M40 (RM3,900 – RM7,599) and T20 (≥ RM7,600) [22]. The PT3 Mathematics achievement's sub-categories also have been rescaled into the lowest (Grades E and F), the average (Grades C and D) and the highest (Grades A and B) achievement based on the grades. The main reason for rescaling these attributes is to provide more meaningful and practical insight. In addition, the total number of items for the self-efficacy, teacher influence, parental influence and peer influence attribute on the designed survey questionnaire are 7, 5, 5 and 5 items, respectively. Hence, the average scores using the median are employed in summarising the scores corresponding to each attribute. The median is employed instead of the mean because these attributes are categorical data from the asymmetrical distribution. Likewise, we also rescale the intrinsic and extrinsic motivational factors according to the literature [23]. Furthermore, several attributes have also been combined, such as ethnicity and parental education level attributes due to the violation of the assumption for $e_{bc}\geq 5$. Indian and others have been combined in the ethnicity attribute, whereas primary and others on the parental education level attribute.

The results of analysis for the full-scale empirical study are depicted in table 3. These include the frequency distribution, Pearson's chi-square test without Yates continuity correction, and the OR corresponding to each attribute. The graphical summaries for the five SES are illustrated in figure 2. The descriptive analysis presented in figure 2 and table 3 shows that the 389 participants in this study comprise 152 (39.07%) male and 237 (60.93%) female students. The ratio of participants from STEM to Humanities & Arts educations is $178:211$ (%:%), and the percentage of participants with the lowest, the average and the highest achievements in PT3 Mathematics are 67 (17.22%), 161 (41.39%) and 161 (41.39%), respectively. Hence, based on the overall PT3 achievement and the subject packages offered in the corresponding school, approximately 17.20% of the students with the lowest achievement in PT3 Mathematics can enrol in Additional Mathematics. Despite their lowest achievements, the students have the preference to enrol in Additional Mathematics. About the family's socioeconomic background, most of the participants are from a low-income family (B40), which numbers $\cong 171$ ($\cong 43.96\%$), and high parental education level (tertiary education), which numbers 210 (53.98%), respectively. Contrarily, the least of the participants are from high-income family (T20) and low parental education level (primary & others), with $\cong 88$ ($\cong 22.62\%$) and 14 (3.60%), respectively.

To acquire the statistical evidence about the association between the enrolment of the Form Four students in Additional Mathematics, $\mathbf{X}_1$ and the potential factors, $\mathbf{X}_j$, Pearson's chi-square without Yates continuity correction test is employed. However, the ethnicity attribute was not considered a factor affecting the enrollment in Additional Mathematics to avoid the sensitivity issue. By using equations (2) and (3), χ^2_{test} and the corresponding *p*-values are given in table 3. In particular, the analysis results show a significant association between the upper secondary students enrolled in Additional Mathematics and the attributes such as parental educational level, PT3 Mathematics achievement, self-efficacy, teacher influence, parental influence, and peer influence. Then, further analysis was conducted to measure the significant strengths of the association between $\mathbf{X}_1$ and $\mathbf{X}_j$ using equation (4), which yielded the significant association without considering the effects of the confounder. In addition, the corresponding 95% C.I. of OR for each $\mathbf{X}_j$ was also constructed. The results of the analysis of OR and the corresponding 95% C.I. of OR are provided in table 3. Comprehensively, the analysis results depicted that the significant affective factors for the upper secondary students in urban areas of Kuantan District enrolment in Additional Mathematics are the educational discipline, the PT3 Mathematics achievement, self-efficacy, teacher influence, and parental and peer influence. These factors yielded significant results for both Pearson's chi-square test without Yates continuity correction and OR.

In particular, the empirical results of this study show that the likelihood of a student from the STEM discipline education to enrol in Additional Mathematics is 44.317 times higher compared to those from the Humanities & Arts discipline education with the corresponding 95% C.I. of OR lies between 21.877 and 89.777. In Malaysia's public education system, Additional Mathematics is one of the elective subjects needed by the other science-related subjects for the STEM discipline education. At the same time, it was an optional subject for the Humanities & Arts discipline education. Therefore, the aforementioned empirical result is valid. The students from the STEM discipline education tend to enrol in additional mathematics than those from the Humanities & Arts discipline education.

Moreover, the likelihood of the student who has the highest achievement in the PT3 Mathematics subjects is 142.734 times higher than the student who has the lowest achievement to enrol in Additional Mathematics with the corresponding 95% C.I. of OR lies between 45.883 and 444.022. Meanwhile, the likelihood of a student with average achievement in PT3 Mathematics is 14.438 times higher than a student who has the lowest achievement to be enrolled in Additional Mathematics, with the corresponding 95% C.I. of OR lies between 5.018 and 41.542. This finding is analogous to the empirical results in previous studies [10,11].

From the psychology perspective, motivation is crucial to assist the students in preparing to face the challenges and compete [3]. Table 3 also indicated that the intrinsic motivational factor such as self-efficacy has a significant effect on additional mathematics enrollment. The likelihood of the student admitted the importance of self-efficacy to enrol in Additional Mathematics is 12.825 times higher than those denied, with the corresponding 95% C.I. of OR lies between 38.772 and 353.930. In contrast, students tolerated self-efficacy have a likelihood of 20.337 to enrol in Additional Mathematics compared to those denied, with the corresponding 95% C.I. of OR is [11.240, 36.797]. Moreover, the student's intrinsic motivation can also be affected by their parents. This is because their parents can help them make a correct decision, and the parents have better prediction skills about the child's learning skills and as the maximum support agents to their children [25]. Thus, this study found that the likelihood of the student who admitted and tolerated the parental influence are respectively 12.825 and 5.392 times higher compared to those who denied, with the corresponding 95% C.I. of OR are [6.965, 23.618] and [3.212, 9.052], respectively.

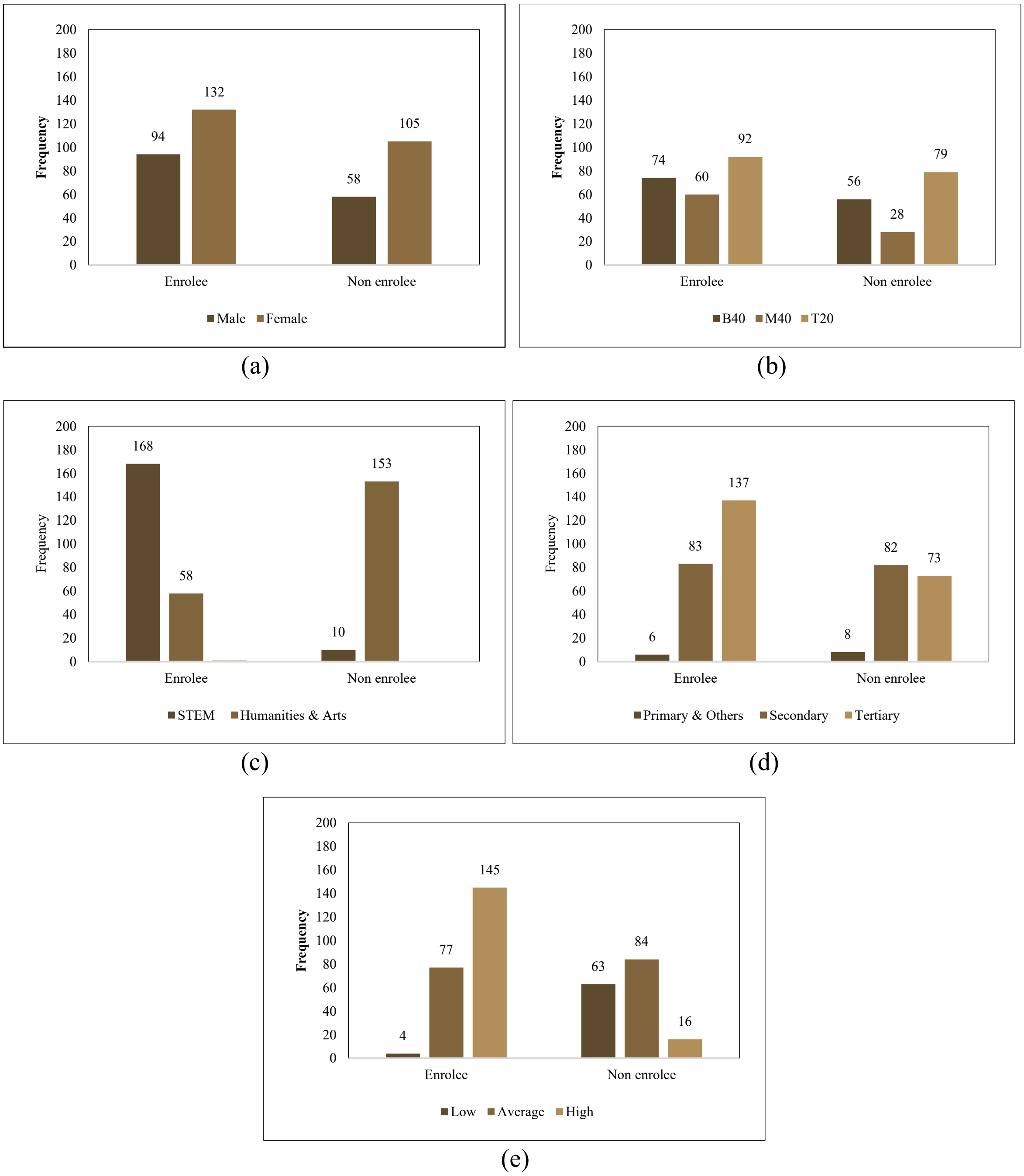

Figure 2. The graphical summaries for the frequency distribution of enrolee and non-enrolee in Additional Mathematics corresponding to (a) gender; (b) household income; (c) educational discipline; (d) parental education level; and (e) PT3 mathematics achievement.

Table 3. The results of analysis of the Pearson's chi-square test and the OR.

Factor	Frequency (Percentage%)		χ^2_{test} (*p*-value)	*p*-value(OR)	95% C.I. of OR
	Enrolee	Non-enrolee			
Gender					
Male	94 (24.165)	58 (14.910)	1.437 (0.231)	1.289 (0.231)	(0.851, 1.954)
Female[R]	132 (33.933)	105 (26.992)		n/a	n/a
Household income					
≅ M40	74 (19.023)	56 (14.396)	5.046 (0.080)	1.135 (0.590)	(0.717, 1.796)
≅ T20	60 (15.424)	28 (7.198)		1.840 (0.027)*	(1.072, 3.158)
≅ B40[R]	92 (23.650)	79 (20.308)		n/a	n/a
Educational discipline					
STEM	168 (43.188)	10 (2.571)	9.852 (0.007)*	44.317 (0.000)*	(21.877, 89.777)
Humanities & Arts[R]	58 (14.910)	153 (39.332)		n/a	n/a
Parental education level					
Tertiary	137 (35.219)	73 (18.766)	177.472 (0.000)*	2.502 (0.101)	(0.836, 7.487)
Secondary	83 (21.337)	82 (21.080)		1.350 (0.594)	(0.449, 4.061)
Primary & others[R]	6 (1.542)	8 (2.057)		n/a	n/a
PT3 Mathematics Achievement					
High	145 (37.275)	16 (4.113)	149.334 (0.000)*	142.734 (0.000)*	(45.883, 444.022)
Average	77 (19.794)	84 (21.594)		14.438 (0.000)*	(5.018, 41.542)
Low[R]	4 (1.028)	63 (16.195)		n/a	n/a
Self-efficacy					
Strongly agree & agree	80 (20.566)	4 (1.028)	184.856 (0.000)*	117.143 (0.000)*	(38.772, 353.930)
Neither agree nor disagree	125 (32.134)	36 (9.254)		20.337 (0.000)*	(11.240, 36.797)
Strongly disagree & disagree[R]	21 (5.398)	123 (31.620)		n/a	n/a
Teacher influence					
Strongly agree & agree	102 (26.221)	18 (4.627)	79.425 (0.000)*	15.786 (0.000)*	(8.147, 30.587)
Neither agree nor disagree	96 (24.679)	67 (17.224)		3.991 (0.000)*	(2.343, 6.800)
Strongly disagree & disagree[R]	28 (7.198)	78 (20.051)		n/a	n/a
Parental influence					
Strongly agree & agree	97 (24.936)	19 (4.884)	88.382 (0.000)*	12.825 (0.000)*	(6.965, 23.618)
Neither agree nor disagree	88 (22.622)	41 (10.540)		5.392 (0.000)*	(3.212, 9.052)
Strongly disagree & disagree[R]	41 (10.540)	103 (26.478)		n/a	n/a
Peer influence					
Strongly agree & agree	125 (32.134)	18 (4.627)	113.534 (0.000)*	24.573 (0.000)*	(12.719, 47.473)
Neither agree nor disagree	75 (19.280)	53 (13.625)		5.007 (0.000)*	(2.861, 8.763)
Strongly disagree & disagree[R]	26 (6.684)	92 (23.650)		n/a	n/a

Furthermore, previous educational empirical studies [4, 8] have shown that external intrinsic motivational factors such as teacher and peer also significantly affected students' interest in enrolling in STEM education. Likewise, the analysis results depicted that the likelihood of a student admitting the peer influence to enrol in Additional Mathematics is 24.573 times higher than those denied. The corresponding 95% C.I. of OR lies between 12.719 and 47.473. Meanwhile, the 95% C.I. of OR for the student tolerated peer influence lies between 2.861 and 8.763. In other words, the likelihood of students accepting the peer influence to enrol in Additional Mathematics is 5.007 times higher than those who denied. In practice, the primary determinant of student engagement, success in subjects and interest in science are teaching and learning approaches and the quality of teaching [8]. Moreover, the teacher is also the primary source in enhancing the students' interest in STEM [4]. Similarly, the analysis results reveal that student who admitted that the teacher influence has contributed to a higher tendency to enrol in Additional Mathematics. The student's likelihood for those admitted the teacher influence is 15.786

times higher to enrol in Additional Mathematics than those denied, with the corresponding 95% C.I. of OR lies between 8.147 and 30.587. The likelihood of enrolling in Additional Mathematics is reduced to 5.392 times higher if a student tolerated the teacher's influence, compared to a student who denied, with the corresponding 95% C.I. of OR is [2.343, 6.800].

4. Conclusion

This article is educational research on investigating the significant factors that affected upper secondary students' enrollment in Additional Mathematics in the urban areas of Kuantan District. The study uses Pearson's chi-square test without Yates continuity correction unadjusted odds ratio. The analysis results reveal that educational discipline, PT3 Mathematics achievement, self-efficacy, teacher influence, parental influence and peer influence are the significant factors affecting the upper secondary students' enrolment in Additional Mathematics. In summary, this article provides new literature for educational research. The finding might be beneficial to the policymakers in instilling student's interest in STEM and pipelines the STEM human capitals demanded in the 21st digital economy era. For instance, teachers' skill can be enhanced throughout the broad career of STEM in the 21st digital market, and consciously review the role of their students in gender socialisation such as curriculum materials, expectation, educational tracking and peer relations. Meanwhile, parents also can be participated in school for building the communicating and coordinating mechanism. Henceforth, the number of upper secondary students enrolled in STEM education might be increased, and Additional Mathematics is the heart of science-related subjects.

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