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**The Effect of Socio Economic Status on Students' Achievement  
in STEM-Based Learning****Nur Suhaidah Sukor**

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University Malaysia Sabah, Sabah, Malaysia**Abstract**

*This paper discusses the impact of family income on students' achievement in STEM-based learning. In this study a total of 129 students Form one (year 13) becomes sample of the research. The data was collected and analyzed by descriptive and two ways ANOVA. The science test contains 37 multiple choice items and reliability of Cronbach Alpha is 0.64. The findings show that there is significant effect on the group based variables on the mean score of the Science Test. There is also significant effect on the SES based variables on the mean score of Science Test. To encourage the participation of students from Middle Income and Lower Income families, the materials and tools used in module were inexpensive and easy-to-find. The findings also show that there is no significant interaction effect between the group-based variables and SES on the mean score of the Science Test. Implications of this research for teachers is to motivate them to employing STEM Inspiration Module in integrated STEM science classroom.*

**Keywords:** science; achievement; socio economic social; family income; STEM Inspiration Module

**1.0 INTRODUCTION**

The post-industrial and post-globalization era has been circled with the progress of Science and Technology. Thus, Science-Technology-Engineering-Mathematics (STEM) was introduced and became the focuses of Ministry of Education Malaysia. In 2013, it is reported that the participation of secondary school

students in the science stream was low, which is 29% and a small fraction of 4.5% in the vocational stream (Mohamad et al., 2015). Moreover, the national achievement score in TIMSS has declined from year 2003 to 2011, and in 2015 students' show slightly increases in science achievement (Curriculum Development Division, 2015). Thus, innovation in science teaching is needed to increase participation and to improve students' achievement in science.

To study this situation in real life setting, we will look at parents' socio economic status. There are three main dimensions of socio economic status (SES), namely parents' education level, occupation type and income. In this study, we will focus on parents' income and their educational level on impacting students' achievement in STEM-based learning.

Good quality of life ensures the comfort of students to learn and live in their daily lives. However, almost 12% (767 thousand) of households in Malaysia earn RM2000 a month and below (Cahron, 2016). In 2007, the poverty rate in Sabah recorded the highest value of 16 per cent compared with Sarawak in second place with 4.2 per cent and lastly Peninsular Malaysia with the lowest percentage of 2.3 per cent. Understanding about family socio economic status is important in this study. This is because, the literature on achievement consistently has shown that parents' income is important in predicting children's achievement (Halle, Kurtz-Costes, Mahoney, 1997; Hak, 2004).

Thus, students are grouped according to theirs' family socio economic status. Based on Poverty Guidelines that issued by Economic Planning Unit (2014), poor families in Sabah are those with household income lesser than RM1170. Based on these reports, families with monthly income of RM710 and below are categorized as Lower Income group. Families monthly earned between RM711-RM1170 were categorized under Middle Income group. Other than this, families with monthly earned of RM1171-RM12159 categorized under Higher Income.

Other than this, parents' educational level also needs to be considered on impacting students' science achievement. This is because, previous researchers reported that students' parental socio-economic status has significant relationship on students' achievement (Ming, 2005; and Zahaya, 2008). Students with low socio economic status lack basic skills in Science, Technology, Engineering and Mathematics (Christensen, Knezek, & Tyler-Wood, 2014). However, students from families with high socio economic status have achieved better academic achievements (Navarro, Flores & Worthington, 2007). This proves that the achievement gap exists between different pupils of socio economic status. Thus, the researchers determine to study the impact of family socio economic background on students' achievements.

## **2.0 AIM OF THE STUDY**

The aim of the study was to learn more about the impacts of family socio economic status on students' science achievement in STEM based learning. The specific goals were (a) to determine the impacts of different socio economic status on students' achievement, (b) to assess the relationship between parents' educational level and students' science achievement.

## **3.0 METHODOLOGY**

This study employed a quasi-experiment that used purposive-sampling to collect data from 126 Form one students. The sample was divided into treatment group and control group. Sample in each group then labelled based on their family socio-economic background (Higher Income, Middle Income and Lower Income).

The science test contains 37 items and covers six topics in Form One Science subject. The face validity was investigated by getting help from panel of expert to ensure readability of the instruments and students comprehension. The science test was tested on 34 students. Linacre (1994) explained that 30 examinees are sufficient for well-designed pilot studies. The reliability of the Science Test instrument result showed value of 0.68. The content and face validity of the test was verified by experts panel.

#### 4.0 FINDINGS

To investigate the parents' socio economic status, the researchers profiled parents' academic level and their income. Table 1 shows the academic level and Table 2 shows parents' income.

**Table 1: Parents' Education Level**

Parent	Level of Education	Frequency	Percentage
Father	Bachelor degree and above	8	6.3
	Diploma	9	7.1
	Higher Secondary School	36	28.6
	Lower Secondary School	14	11.1
	Primary School	22	17.5
	School Drop-out	37	29.4
	Total	126	100
Mother	Bachelor degree and above	14	11.1
	Diploma	3	2.3
	Higher Secondary School	32	25.4
	Lower Secondary School	14	11.1
	Primary School	31	24.6
	School Drop-out	32	25.4
	Total	126	100

The results of the analysis of Father's education level shows that 22 people (17.5%) completed primary school education. Another, 14 people (11.1%) had completed Lower Secondary School and a total of 36 people (28.6%) had successfully completed the Higher Secondary School. There are also parents who pursue higher education such as 9 people (7.1%) with Diploma. Other than this, eight people (5.6%) obtained Bachelor's Degree and above. The remaining of 37 fathers (26.3%) did not go to school.

Furthermore, the researchers examine the level of mother's education. This is because due to the custom and culture, the father serve as bread winner and the responsibility of educating the child is given to the mother. It was found that 31 people (24.6%) completed primary school. A total of 14 people (11.1%) completed the Lower Secondary School and total of 32 people (75.4%) completed Higher Secondary School. There were also mothers who advanced to higher levels such as Diploma three people (2.4%), a Bachelor's Degree of 13 people (10.3%) and only one person hold Master Degree (0.8%). Other 32 people (25.4%) did not go to school. This shows that majority of parents' academic only reached high secondary school. Other than parents' academic level, the researchers also profiled parents' income as shown in Table 2.

**Table 2: Parents' Income**

Categories	Income (RM)	Frequency	Percentage
Lower Income	710 and below	39	31.6%
Middle Income	711-1170	59	46.8%
Higher Income	1171-12159	28	22.2%

The analysis results show that 39 (31.6%) families with monthly income of RM710 and below are categorized as Lower Income group. Furthermore, 59 (46.8%) of the poor families monthly earned of RM711-RM1170 were categorized under Middle Income group. Other than this, a total of 28 (22.2%) families with monthly earned of RM1171-RM12159 categorized under Higher Income.

To confirm the differences of science mean score between groups and SES, researcher need to conduct two-way ANOVA. Thus, statistical assumptions test conducted to ensure the collected data comply with inferential statistical requirements. Result of normality test and homogeneity test shown in Tables 3 and 4.

**Table 3: Normality Test**

Variables	Univariate Skewness		Univariate Kurtosis	
	Treatment	Control	Treatment	Control
Science Test	.44	.69	-.45	-.63

**Table 3: Test of Homogeneity of Variances**

	Levene Statistic	df1	df2	Sig.
Science Test	0.03	1	124	

Based on Table 3, Levene's Test shows that Science Test is not significant. Thus, null hypothesis cannot be rejected. This means that the variance for each group in this study is equally same. The data in this study follow ANOVA test rules. To gain better understanding about this study, Table 4 shows the descriptive analysis of students' score in Science Test based on different socio economic status (SES).

**Table 4: Mean score of Science Test Based on Socio Economic Status**

Group	SES (Income)	Score Mean of Science Test	SD	N
<b>Treatment</b>	Lower	37.52	15.06	15
	Middle	35.06	10.99	25
	Higher	41.49	14.49	19
	<b>Total</b>	37.75	13.33	59
<b>Control</b>	Lower	24.35	9.43	24
	Middle	27.70	13.40	32
	Higher	41.18	13.47	11
	<b>Total</b>	28.71	13.27	67
<b>Total</b>	Lower	29.41	13.40	39
	Middle	30.93	12.83	57
	Higher	41.37	13.89	30
	<b>Total</b>	32.94	13.99	126

**SD** = Standard Deviation

Analysis continued with two-way ANOVA and the results are shown in Table 5. The descriptive analysis shows that the mean score of students' Science Test for treatment group (Higher Income, Middle Income and Lower Income) were much higher compared to the counterparts in control group.

**Table 5: Result of Two-way ANOVA Test for Differences in Mean Score for Science Test between Treatment Groups and Control Group based on SSE Factor**

Variables	Type III Sum of Square	df	Mean Square	F	Sig.	Partial Eta Squared
Group	1344.38	1	1344.38	8.37	.00	.06
SES	2205.42	2	1102.71	6.96	.00	.10
Group*SES	657.20	2	328.60	2.05	.13	.03

The result of the analysis in Table 5 shows that there significant effect ( $p < 0.05$ ) on the group based variables on the mean score of the Science Test,  $F(1, 124) = 8.37$ ,  $p < .001$ . There also significant effect ( $p < 0.05$ ) on the SES based variables on the mean score of Science Test,  $F(1, 124) = 6.96$ ,  $p < .001$ . The findings also show that there is no significant interaction effect between the group-based variables and SES on the mean score of the Science Test,  $F(1, 124) = 2.05$ ,  $p < .001$ .

This shows that treatment groups and control groups show different effects on SES variables. In particular, there is a similar effect on treatment groups ( $M = 41.49$ ,  $SD = 14.49$ ) and control group ( $M = 41.18$ ,  $SP = 13.47$ ) for students coming from the family with Higher Income. Similar effects were also seen for treatment groups ( $M = 35.06$ ,  $SD = 10.99$ ) and control group ( $M = 27.70$ ,  $SP = 13.39$ ) for students coming from family with Middle Income. In addition, similar effects were also seen for treatment groups ( $M = 37.52$ ,  $SD = 15.06$ ) and control group ( $M = 24.35$ ,  $SP = 9.42$ ) for students with family from Lower Income. The findings show that the group with Higher Income that were taught with STEM Inspirational Module achieve better mean scores compared to the peers in control group that received conventional learning. Other than this, the researchers also investigate the relationship of parents' educational level and students' science achievement as shown in Table 6.

**Table 6: Relationship of Parents' Educational Level and Students' Science Achievement**

	Fathers' Educational Level	Mothers' Educational Level	Science Test
Father's Educational Level	1.00		
Mother's Educational Level	.46**	1.00	
Science Test	.06	.13	1.00

\* Correlation is significant at the 0.05 (2-ends) level.

\*\* Correlation is significant at the 0.01 (2-end) level.

Result of Spearman Rho show that there is no significant and positive relationship between the Science Test and the Fathers' Education Level ( $r_s = .06$ ,  $p > .05$ ). The same result was also obtained for the relationship between the Science Test and Mothers' Education Level ( $r_s = .13$ ,  $p > .05$ ).

## 5.0 DISCUSSION

The findings indicate that the mean score of Science Test for treatment group with Higher Income were highest and significantly different from students with Middle Income and Lower Income. The research findings are consistent with Stewart (2008); Navarro, Flores & Worthington (2007); and Hak (2004) that students from Higher Income families obtain high academic achievement. This proves that financial resources affect students' achievement in school (Hak, 2004).

Other than this, results show that both parents' educational level does not have significant and positive relationship with students' science achievement mean score. Therefore, these research findings are contrary to Halle et al. (1997), Hak (2004) and TIMSS (2003) that claimed parental education has a positive relationship with student achievement. This happened because there are parents who support children to study science, but their support is more towards giving moral support, motivation, providing money to tuition classes and buying educational materials (Robiah, 2003). This shows that parents are not directly involved in increasing science achievement. To overcome this problem, the researchers suggest that parents should motivate and supervise their children's learning. Moreover, parents' interest and support in STEM studies have a positive relationship with the students' academic achievement (Lee & Shute, 2010).

While poverty is a major threat to child development, some students from the poor get good results at school despite limited resources (Davis, 2005). Therefore, parents need to provide a stable and emotionally stimulating environment so that the negative effects of family financial sanctions can be reduced. Moreover, the influence of family income decreases as the teenage age increases (Duncan & Brooks-Gunn, 1997).

Accordingly, the STEM Inspiration Module is developed based on the guided inquiry approach. This is because inquiry activities are able to improve student achievement and reduce the achievement gap for students that came from families with low socio economic status (Von Secker & Lissitz, 1999 in Degenhart, 2007). An inquiry-based activity helps students to build knowledge and presents it to solve current problems (Richard, Laufer & Humphrey, 2002). To encourage the participation of students from Middle Income and Lower Income families, the materials and tools used in Inspirational STEM module were inexpensive and easy-to-find. This to ensure that students can easily find and prepared the materials, thus encourage them to participate in STEM-based activities.

## 6.0 CONCLUSION & IMPLICATIONS FOR THE STUDY

This study has added to the literature on parents' education level on students' science achievement. Through the research findings, schools can take effective measures to help and provide students from Lower Income and Middle Income group with learning aids at home. In addition, it is hoped that this report will enable parents to be more aware of their children's academic achievement and help them fulfill their learning needs.

This study support pervious findings on Science, Mathematics, Technological and Engineering integration approaches that have a positive impact on students' interest in learning STEM (Becker & Park, 2011). Furthermore, it can also increase student's interest in STEM subjects, thus promoting high-level thinking as well as student achievement (Stohlmann et al., 2013). Implication of this research for teachers is to motivate them employing scaffolding method in teaching STEM Inspiration Module in integrated STEM science classroom.

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