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The Implementation of the STEM Program on the Academic Performance of Grade 10 Students in a Public Secondary School

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Abstract

The main purpose of this study is to find out the extent of implementation in Science, Technology, Engineering and Mathematics (STEM) program in selected secondary schools of Makati. Specifically, it aims to determine the following: 1) the extent of STEM program implementation on admission and retention of students, curriculum and extra-curricular activities; 2) the general weighted average of grade 10 students in Mathematics, Science and Araling Panlipunan in the first and second grading period; 3) the relationship of STEM program implementation in the academic performance of Grade 10 students; 4) teacher's perception regarding health and social interaction of students; 5) problems encountered by students, parents and teachers of the STEM program.

Seventy-six students, ten teachers and ten parents were purposively selected as respondents. A validated researcher-made survey questionnaire was used as main instrument to gather data. Focus group discussion was also used by the researcher. Using pearson correlation, findings show that there is no significant relationship between the implementation of the STEM curriculum and the academic performance of Grade 10 students. In terms of academic performance, students received a very satisfactory rating in the first and second grading period in Mathematics, Science and Araling Panlipunan. With regard to problems encountered, the three groups of respondents agreed that students were overloaded with activities, groupings and assignments that resulted to less sleep, fatigue, stress, inattentiveness and sickness of students.

Based on the results and findings of the study, recommendation on adjusting class schedule, proper orientation with the parents and teachers about the STEM program, involving parents and other stakeholders in the learning process, constant monitoring of STEM coordinator, principal and DepEd officials and implementation of a management plan were proposed.

Keywords: *STEM program implementation, academic performance, Grade 10 students, public secondary school, curriculum challenges*

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INTRODUCTION

In 2009, Pitogo High School in Makati introduced a STEM program, choosing the top 80 pupils based on their averages in science, math, and English. Compared to the curriculum of the K to 12 Basic Education Program, the core subjects offered in these special classes are enhanced by having additional subjects identified in the Revised Curriculum of STEM. The eight (8) basic subjects—English, Filipino, Mathematics, Science, Araling Panlipunan, MAPEH, TLE and Values Education, add-on subjects in Mathematics and Science are offered.

However, the researcher experienced challenges teaching these students such as difficulty of getting their full attention and of maintaining their level of interest because of physical and mental stress in various activities in school. There were some instances that students sleep during class hours since students under this program are required to extend school hours or even stay the whole day in school for their additional Science and Mathematics subjects which include Research and Laboratory works. Teachers of other subjects have the same complain about students' performance during their classes. This study is supported by researches conducted by Talib and Zia-ur-Rehman (2012) and Shapiro and Williams (2014) which state that load course, stress, social activities and inadequate sleep affect academic performance of the students. It is in this light that the researcher took the interest to conduct the study of the extent of the implementation of the STEM program in relation to the performance of grade 10 students of Pitogo High School.

This study assessed the extent of the implementation of the STEM program and the academic performance of grade 10 students of Pitogo High School.

Specifically, it aimed to answer the following questions:

1.What is the extent of the implementation of the STEM program as perceived by teachers and students in terms of the following:

1.1 admission and retention of students;

1.2 curriculum?

2. Is there a significant relationship between STEM program implementation and the academic performance of Grade 10 students?

3. What are the problems encountered by the students, parents and teachers in the STEM program?

METHODS

This study utilized the descriptive method of research. Descriptive research describes a certain present condition. In this study, the perception of students, teachers and parents about STEM program implementation was described. The respondents' views were also described through interviews that focused on the difficulties encountered.

A researcher-made survey questionnaire was used to administer responses from students. The same questionnaire was also administered to teacher-respondents of Grade 10 to know their perception on the STEM program. The questionnaire made by the researcher was presented to her adviser and was checked and validated by the three panel members for approval and modification. After the validation, it was pre-tested to the Grade 9 STEM students to ferret the flaws of the questions in the questionnaire. These students were not included as respondents of the study. After the dry-run, results were drawn and tabulated. From the result, it gained an average Cronbach's alpha of .719 which means that the instrument was reliable and valid.

Documentary Analysis was also facilitated wherein the Form 137 was reviewed to analyze the academic performance of the Grade 10 STEM students in the first and second grading periods in Mathematics, Science and Araling Panlipunan subjects which was the basis of academic performance.

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The data processing was done through the use of SPSS version 20 and was analyzed utilizing the following techniques in presenting the data for quantitative analyses such as Frequency and Percentage, Standard Deviation, and Pearson Correlation.

RESULTS AND DISCUSSION

1. Extent of the implementation of the STEM program in terms of the following:
1.1 Admission and Retention of students

Table 1
Extent of the Implementation of the STEM Program in terms of Admission and Retention of Students

Indicators	Student-respondents			Teacher-respondents		
	Mean	**SD**	**Int.**	**Mean**	**SD**	**Int.**
1. Criteria for admission in the program are clear to all students, teachers and parents.	3.9079	1.00899	GE	3.5000	.97183	GE
2. Principal's (Grade 6) recommendation was asked before admission to the STEM program.	1.5526	.82292	LE	1.9000	1.19722	LE
3. Before admission to the program, grades were properly evaluated.	4.4211	.85265	GE	3.9000	.99443	GE
4. Students were the ones who applied to be included in the STEM program.	1.7632	1.09384	LE	1.6000	.84327	LE
5.Teachers identified students to be included in the STEM program.	4.0658	1.29960	GE	3.8000	1.39841	GE
6. Strict interview was conducted to students before being included in the STEM program.	1.8816	1.21070	LE	2.5000	1.50923	LE
7. Interview was conducted to parents before being included in the STEM program.	1.8026	1.13160	LE	2.1000	1.44914	LE
8. Entrance exam was given before admitting to the STEM program.	4.6974	.80033	VGE	4.7000	.94868	VGE
9. Students who did not meet the required grade are put under probation.	3.0658	1.28929	ME	1.7000	1.05935	ME
10. Students who failed or who did not meet the required grade are removed from the STEM program.	2.3289	1.35044	LE	2.0000	1.33333	LE
Composite	**2.9487**	**1.08604**	**Moderate Extent**	**2.7700**	**1.17049**	**Moderate Extent**

Legend: 5.00-4.51=Very Great Extent; 4.50-3.51=Great Extent; 3.50-2.51=Moderate Extent; 2.50-1.51=Little Extent; 1.50-1.00=Very Little Extent

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It can be gleaned further that recommendation from principal before admission, sole application of student in the program, interview of students & parents and removal of students if they failed to meet the requirement of the program are in the little extent of implementation. These results were supported during researcher's interview with the students saying that they were not the ones who applied to be included in the program. *"Nung nag-enroll po kami noong Grade 7 kami at nakita na mataas ang average namin sinabi na isasama kami na kukuha ng exam para sa STEM".* This means that students were not the one who initiated to be part of the program. With regards to item number ten (10), students confirmed that even if a student did not meet the required grade, they are not removed from the program. One of the students said, " *hindi daw po kami pwedeng mabawasan kaya kahit mababa ang grade ng iba hindi po naalis sa STEM."* When the researcher asked the reason, they could not give an answer; even the subject teachers were confused regarding the policies of the program.

1.2 Curriculum

Table 2
Extent of Implementation on the STEM Program in terms of Curriculum

Indicators	Student-Respondents			Teacher-Respondents		
	Mean	SD	Int.	Mean	SD	Int.
1. Subjects offered in the STEM program are appropriate to the objectives of the curriculum.	4.487	.6632	GE	4.000	1.0541	GE
2. Add-on subjects in Math and Science are difficult for each level.	4.342	.7581	GE	3.700	1.4181	GE
3. Subjects in Math and Science are given much priority than other subjects.	3.974	1.020	GE	4.100	1.6633	GE
4. Subjects have too many requirements.	4.421	.8526	GE	3.700	1.2517	GE
5. Students have enough sleep after finishing all the assignments and school activities.	1.790	.9283	LE	2.300	1.4181	LE
Composite	**3.8028**	**0.844**	**Great Extent**	**3.560**	**1.1728**	**Great Extent**

Legend: 5.00-4.51=Very Great Extent; 4.50-3.51=Great Extent; 3.50-2.51=Moderate Extent; 2.50-1.51=Little Extent;1.50-1.00=Very Little Extent

It could be gleaned in Table 2 that extent of implementation of the STEM program in terms of curriculum yielded a composite mean score of 3.8348 and 3.7300 with .86509 and 1.17280 corresponding standard deviation. It further implies a great extent of curriculum in the implementation of the program.

Little extent of implementation is evident with the students enough sleep after finishing all the assignments and school activities. This result was supported during researcher's interview with the students.

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Most of them said they only have three to four hours of sleep every day because of too many assignments and outputs given by their teachers.

2. Relationship between STEM Program Implementation and the Academic Performance of Respondents

Table 3
Relationship Between Extent of STEM Program Implementation and Academic Performance of the Respondents

Variable	MATHEMATICS			SCIENCE			ARALING PANLIPUNAN		
	r	Sig	Interpret	R	sig	Interpret	R	sig	Interpret
Admission and Retention	-.252	.028	*Significant*	.071	.543	Not Significant	.042	.720	Not Significant
Curriculum	-.114	.327	Not Significant	-.123	.288	Not Significant	.029	.804	Not Significant
Composite	**-.139**	**.338**	**Not Significant**	**-.048**	**.420**	**Not Significant**	**.038**	**.748**	**Not Significant**

Using Pearson r, the relationship between STEM program implementation and academic performance of Grade 10 students is only significant between admission/retention and Mathematics academic performance of students with r value of -.252 and .028 against a corresponding sig value at 5% level of significance.

Generally, the relationship of the STEM program implementation to the academic performance of students has no significant correlation as revealed with composite score of each variable. The sig value implies results which are greater than 5% level of significance to denote acceptance of null hypothesis.

3. Problems Encountered in the STEM program

3.1 By Students

During the interview, majority of the students answered that they encountered different problems since they became part of the STEM program. From the focus group discussion, the researcher noticed that most of the difficulties encountered by students with their subjects are the overload of activities, readings and assignments. Some of them also said that their Research class involves too many expenses although there is a budget for it but most of the time students need to shell out money from their own pockets in order to finish it. Majority of them believe that their time in school is not enough to accomplish everything that they need to do. Students also complain about the groupings after the class for most of the subjects. This made them to go home late almost every day and affected their family time and interaction with other friends.

When it comes to their subject-teachers, most of them think their teachers give them too many assignments and activities that they think some are too difficult to accomplish. There were also some instances when most of the teachers give projects and outputs and have it pass on the same deadline. One of the students said: "*parang nag-uusap-usap ang mga teachers na sa ganitong araw ipasa ang project or output".* Some of them also think that their teachers are inconsiderate and have too high expectations on them.

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3.2 By Parents

Parents' answers are concurrent with their children's answers. Majority of the parents observed that their children do not have enough sleep because of too much activities and assignments. They also noticed that their children looked stressed since they became part of the STEM Program because aside from overload of activities, they have to attend their groupings after class and then have to do their assignments when they got home. Both students and parents agree that being in the STEM program requires too many activities and outputs. This result has an average of four hours of sleep every day.

3.3 By Teachers

Only one out of ten teachers was oriented about the STEM curriculum and it was the class adviser. Other teachers were not aware of the systems and current trends of the STEM program because there was no orientation or seminar conducted for teachers before letting them teach or handle the STEM classes. That is why teachers teach the same lessons they teach in the non-STEM sections. Only three teachers believe that the subjects offered are relevant to the present or future situation of the students because according to them the curriculum does not differ from the regular classes the only difference is that they only have one or two additional subjects like the research.

Conclusion

There were shortcomings in the admission and retention of students of the STEM program like conducting an interview to parents and students and removing students from the program who did not meet the required grade.The enormous activities, assignments, groupings, projects and outputs resulted to sleepiness, stress, inattentiveness and sickness of the students as revealed from the survey questionnaire and interview.The Grade 10 STEM students demonstrated very satisfactory ratings in Mathematics, Science and Araling Panlipunan. Teachers handling Grade 10 STEM sections were not fully aware about the STEM curriculum since no orientation or seminar was conducted about this program. Despite some flaws in the implementation, overload of requirements, activities and stress, the Grade 10 STEM students still managed to perform well and attain very satisfactory remarks. It could be concluded that these students have adapted to the situation since they are already in Grade 10.

Based on the findings and conclusions of the study, the researcher arrived at the following recommendations:

The guidelines and procedures of the STEM program must be strictly followed by the school officials. Programs and activities must be aligned with the objectives of the STEM program. Students with difficulty coping up with lessons must be given remedial classes or encourage peer tutoring among student. Teachers must collaborate with each other in giving deadlines like project to students in order to lessen the pressure and prevent accumulation of requirements needed to pass in a particular day. They should also consider giving short and reasonable length of assignment that is humanly possible because there are other subject teachers who also give assignment. Teachers must also limit giving unnecessary groupings to students after class hours. Involve the parents in some of the students' activities. This will give chance for the parents to better understand what their child is doing and to have a quality time with the family. There must be a proper orientation, seminar or training for teachers handling STEM students. Teachers should select, prepare and utilized proper teaching strategies suitable to students' ability in order to maintain their level of interest on a particular subject area. The school principal should undertake monitoring of the STEM program and proper evaluation that will be of benefit to the student of the said program.

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