

K-12 STEM Track in One Public Secondary School: Opportunities and Challenges

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Abstract – This is a descriptive study which aimed to determine the opportunities and challenges in the implementation of science, technology, engineering and mathematics (STEM) K-12 program. The respondents of this study were the administrators, teachers and students of one public secondary high school in the Philippines. Thematic analyses were used in the interpretation of qualitative part of this research. The results of the study showed that the administrators had very high extent of opportunities on the implementation of the STEM K-12 program in terms of curriculum and instruction, faculty qualifications, learning resources and physical plant and facilities. Moreover, teachers and students had very high extent in almost all areas except on areas on curriculum and instruction and faculty qualifications. The study also found out that there is no significant difference among the administrators, teachers, and students in the extent of opportunities and challenges in the implementation of the STEM K – 12 program. This study recommends that administrators, teachers and students should be open to all forms of media which will help them to get a better understanding about K – 12 program.

Keywords –challenges, opportunities, STEM program

INTRODUCTION

The Philippine Basic Education adapts the implementation of the K-12 Curriculum starting school year 2012-2013. The said advancement in Philippine

education has been made legal by the Republic Act 10533 or the Enhanced Basic Education Act 2013.

REPUBLIC Act No.10533 or the Enhanced Basic Education Act is a law that implements K to 12 Program which covers kindergarten and 12 years of basic education [1]. One of its controlling standards is making Filipino graduates "globally competitive" keeping in mind the end goal to serve the requirements of a "globalized domain." It additionally made ready for protracting the fundamental training project to an aggregate of 12 years from the present 10-year program [2].

Crisol and Alamillo[3] pointed out that the present educational programs is depicted as congested. This implies students don't get enough time to perform undertakings in light of the fact that the educational system is intended to be instructed in a traverse of 12 and not 10 years. Science Technology Engineering and Mathematics (STEM) is an academic track of K-12 program that can prompt gainful employment which is basic to country's development [4]. In a

study conducted by Estonanto [5] he found out that facilities and instructional materials are the two areas that encountered problems along its implementation. Vizconde [6] emphasizes that there is a need for science and mathematics teachers to be fully equipped with various skills in order for them to perform their tasks and to realized and attain their teaching competencies. In addition to this, Batomalaque[7] pointed out that in the National Achievement Test students' performance revealed that science and mathematics continues to be the most difficult areas in basic education. Furthermore, Imam [8] noted that Filipino students disturbing performance in academics in both local, nationally and international arena requires substantial efforts from the government. Hence, the Philippine government initiative of implementing K-12 in our educational system could be a possible solution to address the gap stated above.

However, in the K-12 pilot implementation several arguments and recurring doubts have surfaced such as scarcity of learning materials, lack of classrooms and even the qualifications of teachers who will teach the senior high programs had become a national issue. All these and other concerns, prompted the researcher to conduct the study on the opportunities and

challenges in the implementation of K-12 STEM track in Negros Island Region, Philippines.

OBJECTIVES OF THE STUDY

The main objective of this study is to determine the opportunities and challenges in the implementation of K-12 STEM track in one public secondary school in the Philippines. Specifically, the study aimed to (1) Determine the extent of challenges and opportunities in the implementation of K-12 STEM track as assessed by administrators, teachers, and students; (2) Test if there is a significant difference on the extent of challenges and opportunities in the implementation of K-12 STEM track as assessed by administrators, teachers and students; (3) Determine the challenges encountered on the implementation of the program and (4) Determine the opportunities they can get for the program on future life situations.

Ho: There is no significant difference on the extent of challenges and opportunities in the implementation of K-12 STEM track as assessed by administrators, teachers and students.

METHODS

This study is a descriptive quantitative-qualitative in nature and survey research design was utilized. Descriptive method of research aimed at finding out "what is," so observational and survey methods are frequently used to gather and collect descriptive data. It is research methodology focuses with the present phenomenal conditions such as practices, beliefs, processes, relationships or trends [9]. The study utilized a stratified random sampling technique to determine the sample size of the study. A content validated research survey instrument was used to address the problems set forth in this study. The used of frequency, mean and t-test were the statistical tools used in this study, while thematic approach were used to analysed the responses of the respondents in an open-ended questions. The 0 .05 level of significance was used to test the hypothesis set forth in this study.

Respondents of the Study

The present research utilized the administrators, teachers and students of one public secondary school as respondents of the study. The school is identified as one of the secondary schools that offers K-12 STEM track program. There are 268 respondents of the study. Of the 268 respondents, 4 or 1.50% of them

were administrators, 33 or 12.31% of them were teachers and 231 or 86.19 % of them were students.

Instrument

This study utilized the researcher made survey questionnaire that were content validated by curriculum experts as the primary instrument for gathering data. The research instruments utilized in this study was consists of three (3) parts. Part I, profile of the respondents of the study. Part II, series of questions that includes the extent of opportunities and challenges in the implementation of STEM as assessed by administrators, teachers and students. Part III, a series of open-ended questions which determine the opportunities and challenges that the respondents encountered on the implementation of the senior high school in science, technology, engineering and mathematics (STEM) track.

The answers for open-ended questions were written by each of the respondents on the questionnaire to ensure precision and accuracy of data collection.

Validity

This study utilized content-related validation to determine the validity of the research instrument. Content-related validity determines the extent of which the assessment is the representative of the domain of the interest [10]. Jury validation was used in this study. Experts in the field of K-12 STEM program was asked to evaluate each of the statements in the questionnaire, whether or not items reflect what it intends to measure.

The jury validation shows that developed research instrument is valid to a very high degree with the mean of 4.0.

Reliability

Colin Phelan and Julie Wren (2006) defines reliability as the degree to how much an evaluation instrument produces steady and predictable outcomes [11]. In this study, the reliability of the research instrument was determined using Cronbach Alpha. The obtained reliability of the test was .868. This shows that the developed instrument is reliable to a high degree.

Data Collection Procedure

In conducting the study, permission from the office of the Division Superintendent was asked for the conduct of the research instruments to the target respondents.

After the permit was granted, the researcher reproduced copies of the questionnaires and conducted it to respondents of the study. The conduct and retrieval of the research instrument lasts for 3 weeks. After the questionnaire distribution, the questionnaires were retrieved and the data was tallied, tabulated, analyzed, and interpreted according to the specific problem set forth in this investigation.

Statistical Analysis of the Data

To describe the extent of opportunities and challenges in the implementation of STEM as assessed by the administrators, teachers, and students, the scale and its interpretation below was used.

Scale	Interpretation
4.20 - 5.00	Very High Extent
3.40 - 4.19	High Extent
2.60 – 3.39	Moderate Extent
1.80 – 2.59	Low Extent
1.00 – 1.79	Very Low Extent

To determine if there is a significant difference on the extent of opportunities and challenges in the implementation of STEM as assessed by the administrators, teachers, and students, Analysis of Variance (ANOVA) was used.

To determine the opportunities and challenges on the implementation of the general academic services strand STEM K-12 program as perceived by the school administrators, teachers and students, the researcher made use of thematic approach.

RESULTS AND DISCUSSION

Table 1. The extent of opportunities in the implementation of STEM as assessed by the Respondents

Areas	Respondents	Mean	SD	Interpretation
Curriculum and Instruction	Administrators	4.50	.57	VHE
	Teachers	4.15	.90	HE
	Students	4.30	.81	HE
Faculty Qualifications	Administrators	4.50	1.0	VHE
	Teachers	4.15	.79	HE
	Students	4.29	.91	HE
Learning Resources	Administrators	4.75	.50	VHE
	Teachers	4.21	.81	VHE
	Students	4.34	.82	VHE
Physical Plant and Facilities	Administrators	4.50	.57	VHE
	Teachers	4.30	.68	VHE
	Students	4.39	.73	VHE

Legend: VHE- Very High Extent; HE-High Extent

Table 1 displays the extent of opportunities in the implementation of STEM as assessed by the respondents. Results showed that administrators have a very high extent of opportunities in the implementation of STEM in four areas such as curriculum and instruction, faculty qualifications, learning resources and physical plant and facilities with a mean of 4.50, 4.50, 4.75 and 4.50 respectively. Generally, there is a very high extent of opportunities in the implementation of STEM in all areas as observed by the administrators which showed that they have a positive outlook in the implementation of the said K-12 track. Similarly, the study conducted by Estonanto [5] revealed that administrators have a very high acceptability level of the STEM curriculum. Furthermore, the data revealed that teachers have a very high extent of opportunities in areas like learning resources and physical plant and facilities with a mean of 4.21 and 4.30, however high extent were noted on areas like curriculum and instruction and faculty qualifications with a mean of 4.15 respectively. Moreover, reviews find that instructors of K–12 arithmetic and science need trust in their capacity to educate designing [12]. Students viewed that they had a very high extent of opportunities in areas like learning resources and physical plant and facilities with a mean of 4.34 and 4.39 respectively. Existing school offices as a rule offer critical chances to fulfill not just the adapting needs of all students, yet a significant number of the social and recreational requirements for the group. School structures, their substance and grounds, regularly speak to the biggest single resources of generally groups. To empower students’ enthusiasm on science courses implies the sign of a discernment on the significance of arithmetic courses, through the exhibit of arithmetic courses' application furthermore, its relationship in designing [13].

The data on table 2 reflected that in areas like curriculum and instruction, faculty qualifications and learning resources the teachers and students have a very high extent of challenges in the implementation of STEM. This implies that both teachers and students feel that the K-12 STEM track implementation poses a great challenge on their part. The change to utilize spiral progression approach was perceived to be troublesome to students as well as to teachers [14]. The data also revealed that administrators have a very high extent of challenges in terms of learning resources with a mean of 4.22.

Table 2. The extent of challenges in the implementation of STEM as assessed by the respondents

Areas	Respondents	Mean	SD	Interpretation
Curriculum and Instruction	Administrators	3.75	.50	HE
	Teachers	4.42	.66	VHE
	Students	4.23	.92	VHE
Faculty Qualifications	Administrators	4.00	.81	HE
	Teachers	4.24	.79	VHE
	Students	4.33	.05	VHE
Learning Resources	Administrators	4.21	.77	VHE
	Teachers	4.21	.89	VHE
	Students	4.27	.81	VHE
Physical Plant and Facilities	Administrators	4.00	.81	HE
	Teachers	4.18	.80	HE
	Students	4.13	.81	HE

Legend: VHE- Very High Extent; HE-High Extent

The inaccessibility of learning materials is only one of the issues as yet bothering the nation's new essential training program, K to 12. Long-standing issues, for example, lack of instructional materials and poor foundation all add to our predictable poor performance. This finding is supported by Legaspi [15], he pointed out that inaccessibility of learning materials is only one of the issues as yet harassing the nation's new essential training program, K to 12, in the three years of its implementation.

Table 3. Differences on the extent of challenges in the implementation of STEM as assessed by administrators, teachers and students

Source of Variation	Sum of Square	DF	Mean Square	f	P
Between Groups	0.032	2	0.016	0.058	0.944
Within Groups	73.806	267	0.276		
Total	73.838	269			

**Significant*

Table 3 shows that there is no significant difference on the extent of challenges in the implementation of STEM as assessed by administrators, teachers and students with a p value of .944. The respondents view on the areas such as curriculum and instruction, faculty qualifications, learning resources and physical plant and facilities did not differ significantly. The hypothesis which states that there is no significant difference on the extent of challenges in the implementation of STEM as assessed by the administrator, teachers and students is therefore accepted.

Table 4. Differences on the extent of Opportunities in the implementation of STEM as assessed by administrators, teachers and students

Source of Variation	Sum of Square	DF	Mean Square	f	P
Between Groups	0.410	2	0.205	0.205	0.87
Within Groups	62.869	267	0.235		
Total	63.279	269			

**Significant*

Table 4 shows that there is no significant difference on the extent of opportunities in the implementation of STEM as assessed by the administrators, teachers and students. The respondents viewed that there is a very high extent of opportunities in the areas of curriculum and instruction, faculty qualifications, learning resources and physical plant and facilities along the implementation of STEM K-12 program. The hypothesis which states that there is no significant difference on the extent of opportunities in the implementation of STEM as assessed by the administrators, teachers and students is therefore accepted with a P value of .870.

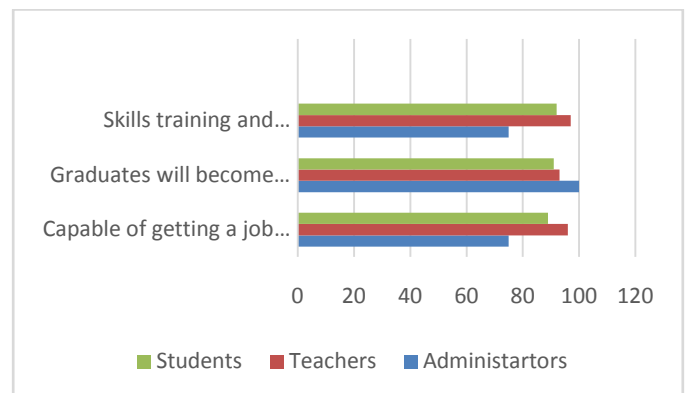


Figure 1. School administrators, teachers and students statements on the opportunities of the program on future life situations

The teachers and students have comparable perspectives on winding up comprehensively focused because of the execution of the K-12 program overall (Figure 1). The educator respondents had wonderful respect on the ability of the K-12 alumni of landing a position after graduation. The accreditations of abilities will be issued after appropriate assessment by the administration organization called Technical Education and Skills Development Authority

(TESDA) will empower the K-12 graduates land a position requiring specialized and professional aptitudes. These statements indicate out high any expectations of the respondents on the likelihood of K-12 graduates in Philippine schools for common acknowledgment on instructive arrangements for college work will in the end qualify them to get equivalent open doors for work in the worldwide market. These statements are the normal results which are yet to be found in the following five years. Strategies on work in the worldwide market and openings on instruction in the nation and abroad ought to in this way be generally scattered for better situating of the nation's human asset.

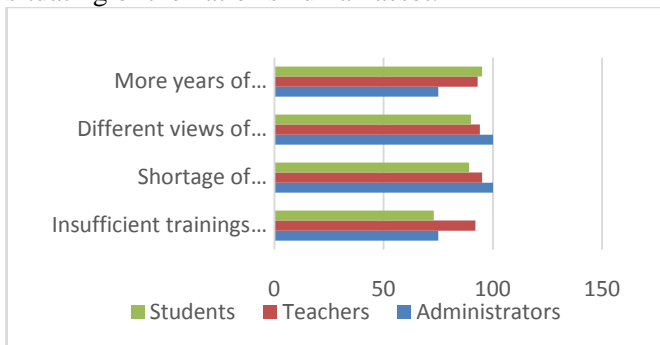


Figure 2. School administrators, teachers and students statements on the challenges of the implementation of the program

The administrators and teachers shared similar views on shortage of educational resources and different views of trainers and lecturers. On the other hand both teachers and students perceived that the implementation of the program could add more years to education.

The predominant thought on fundamental instruction is only an arrangement for school or college confirmation and not as planning for work in this way, the arrangement of Technology and Livelihood Education "TLE" in the K-12 educational programs (intended to get ready understudies for work after graduation from senior secondary school) is assumed by a few guardians as get ready semi-gifted youth to the work constrain at an early age of eighteen (18) and could prompt labor misuse. The conventional Filipino people consider the age of eighteen as somewhat youthful to settle on free choices and take genuine duties, for example, acquiring as a profession. The SEAMEO-INNOTECH (2010) [16]report demonstrated that the

Philippines ought to enhance its instructive objectives to make them clearer more centered around the securing and authority of learning capabilities and abilities coveted in the 21st century.

CONCLUSION AND RECOMMENDATION

There is a very high extent of opportunities and challenges in the implementation of STEM as assessed by the respondents. There is no significant difference on the extent of opportunities and challenges in the implementation of STEM in the areas of curriculum and instruction, faculty qualifications, learning resources and school plant and facilities.

The researcher recommends that administrators, teachers and students should be open to all forms of media which will help them to get a better understanding about K – 12 program. Future researchers should conduct a study on the effectiveness of K – 12 after the implementation of the program. This study also recommends that the implementation of this program may combine with nonstop expert trainings of educators to clear ranges of misinterpretations, for example, on evaluating framework, aptitudes advancement for business guidelines, and on handling of learning exercises to achieve target capabilities and accomplishment of authority. This study further recommends future researches to conduct study on the implementation of K-12 program considering other variables.

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