Acceptability and Difficulty of the STEM Track Implementation in Senior High School

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Abstract - *The Department of Education in the Philippines implemented the Enhanced Basic Education Curriculum in 2013 which led to the creation of Senior High School Program. Studies showed the importance of the support of stakeholders to the success of an educational reform. Thus, it is significant to consider the acceptance of the new curriculum. This descriptive- correlational study sought to determine the acceptability of the Senior High School STEM program and correlate it to the difficulty level of problems along its implementation. Findings showed that there was low acceptability of the new curriculum among stakeholders. It also revealed that the major problems along the implementation of the curriculum were on the areas of Facility and Instructional Materials, and that the difficulty level of the problems was high. Finally, it was found out that there was significant inverse correlation between the curriculum's acceptability level and the problems' difficulty level. Thus, the study concludes that the acceptability level of curriculum is significantly related to the difficulty level of the problems encountered by the school along its implementation. The researcher recommends that a series of information-dissemination programs be conducted to raise awareness on the significance of the STEM Curriculum among the stakeholders of the school. Interventions were also proposed to address the problems*

Keywords: *acceptability level, difficulty level, perception, acceptance, problems, implementation, senior high school, STEM curriculum, curriculum, program*

INTRODUCTION

Republic Act 10533 otherwise known as the Enhanced Basic Education Act of 2013 mandates the Department of Education to create another level of the basic education composed of two years. These two additional years in the secondary level shall comprise the senior high school program as set by the aforementioned law [1]. The primary goal of the program is to prepare secondary students to master the prerequisite skills needed in professional courses for those who will prefer academic tracks and to equip with employment and industrial skills needed for those who will prefer technical- vocational and other tracks [2]. Braza [3] mentioned that the new curriculum was the response of the government to the call of the educators for the standardization of the country's educational system to comply with international standards.

The Science, Technology, Engineering and Mathematics (STEM) track of the Philippine K to 12-Enhanced Basic Education Curriculum is designed to produce graduates of secondary level who will take science, research, mathematics and engineering-related courses in tertiary level and thereby add to the scientific and scholarly workforce of the country. [4] It can be noted that Magno [5] said that a curriculum that is purposely designed for mathematics and science- inclined students could be the answer to a decade- long problem of low number of mathematics and science practitioners in the country. The low number of science professionals may be attributed to the poor academic performance of students in mathematics both in the elementary and secondary level. The study of Estonanto [6] pointed out that majority of secondary students are in the beginning level of mathematics proficiency. Moreover, Lee-Chua [7] cited that Filipino learners have never been noted for excellent numerical ability. Thus, the implementation of the program could be an effective approach to address the problem.

Nevertheless, on the early stages of the implementation of the K to 12 curriculum, several oppositions to the program arose. Among the noted efforts to stop the new curriculum were the present cases in the Supreme Court to cite a few: Council for Teachers and Staff of Colleges and Universities of the Philippines, et al. v. President of the Philippines, et al., Antonio "Sonny" F. Trillanes IV, et al. v. Executive

Secretary, et al., Richard Troy A. Colmenares, et al. v. DepEd Secretary, et al., Ma. Dolores Brillantes, et al. v. President of the Philippines, et al. and two others. [8] In the school level, administrators also struggle for the acceptance of the program among its stakeholders especially to parents who still want the previous 4- year high school curriculum since the additional two more years would be another burden to them. This acceptance could have effect on the difficulty of the implementation of the program.

State Universities and Colleges (SUC) can offer senior high school program as part of their laboratory schools.[9] In adherence to the mandate of R.A. 10533 and DepEd Order No. 43 s. 2013, the new curriculum was formally implemented starting June 2016. Since S.Y. 2016- 2017 is the pioneer academic year of its implementation, a study on the acceptance of the program among the stakeholders of the school would be of great help to its implementers particularly to the front liners—the teachers. Studies showed the importance of the support of stakeholders to the success of an educational reform. Thus, it is significant to consider the acceptance of this new program. This study is about the acceptability of the Sorsogon State College Senior High School- Science, Technology, Engineering and Mathematics Program and the difficulty of its implementation. It is primarily concerned with the correlation between the two aforementioned variables.

OBJECTIVES

The main purpose of this study is to determine the perceived acceptability of Sorsogon State College Senior High School- STEM Curriculum and the difficulty of the problems encountered by the school along its implementation. Specifically, the study aimed to:(1) Determine the acceptability level of the SSC Senior High School- STEM curriculum among the following stakeholders- students, parents, faculty members and administrators; (2) Determine the difficulty level of the problems encountered along its implementation and the areas in the implementation that encountered major problems; (3) Test the relationship between the perceived acceptability and difficulty of the implementation of the curriculum and; (4) Propose intervention programs that will address the problems and thereby strengthen the implementation of the Senior High School- STEM curriculum.

METHODS

This study utilized the descriptive- correlational and developmental method of research. It is descriptive since it is concerned with determining the level of acceptability of the newly implemented curriculum and finding out the problems encountered along its implementation and the difficulty level of these problems. Likewise, it is correlational because it sought to test the relationship between the acceptability of the new program and the level of difficulty of the problems encountered. It was primarily designed to determine the acceptability level of the SSC- STEM Curriculum and correlate it to the difficulty level of problems along its implementation. A content- validated survey- questionnaire was used as the primary instrument of this research. Statistical tools utilized were frequency count, ranking, percentage, mean and Pearson's coefficient of correlation. The null hypothesis was tested using non-directional t- test at 0. 05 level of significance.

Respondents of the Study

The researcher used Purposive Sampling in the determination of the respondents. The study involved 101 respondents which is the main subject of the research. Of which, 25 % of the total number of students and parents were taken as sample who were identified through Simple Random Sampling or Fish Bowl Technique. Purposive sampling was utilized particularly to parent respondents because there was an observed low attendance in PTA meetings in the institution due to the far distance of the school. Zulueta and Perez [10] said that the minimum sample for smaller populations should not go lower than 20 % of the population which this study exceeded. Conversely, total enumeration for faculty member respondents and administrator respondents was considered in this study. This is because the number of faculty and administrators is fewer as compared to students and parents. Thus, the participants in this study were: 45 students, 45 parents, 6 faculty members and 5 administrators of the senior high school program respectively. Upon the distribution of the questionnaires, the participants were informed about the purpose of the study. Moreover, utmost confidentiality was observed in the treatment of data.

Instrument

Researcher- developed survey- questionnaires that were content- validated by the dean of the College of Education, two professors in Curriculum

Development and one professor in Administration in the Graduate Studies, and the principal of the senior high school program to determine the acceptability level of the curriculum, the areas of implementation that encountered major problems, and the difficulty level of the implementation of the program. Content Validation is a method of validating the test instrument with the help of critiques who are authorities in their own disciplines. Aquino[11] stressed that a minimum of three instrument-evaluators may be required to maintain the credibility of the validation process. It can be noted that Aquino and Garcia [12] mentioned that a good instrument should provide clear, unambiguous, specific and complete directions so that the validity will not be affected. Major revisions on the directions, content items and scoring were done based on the recommendations of these experts. Moreover, two dry- runs were also conducted prior to the actual release of the instrument to the respondents to secure both its validity and reliability. The instrument was found to be highly reliable with 0.90, 0.85, 0.89, 0.89, 0.90, 0.96 and 0.91 Cronbach alpha reliability scores for the Acceptability, Curriculum, Faculty, Facility, Instructional Materials, Instruction and Learners respectively. Suggestions in the try- outs were considered in the finalization of the questionnaire.

The instrument was divided into two parts- Part I and Part II measure the acceptability level of the program and difficulty of its implementation correspondingly. For Part I, the following five- point Likert Scale was adopted in the instrument: 5- Very Much Agree, 4- Agree, 3- Moderately Agree, 2- Disagree and 1- Very Much Disagree [13].

Likewise, the same five- point scale was utilized in the Part II of the instrument. However, it was modified to address the factors it was intended to measure. The scale was presented as follows: 5- Very Poor, 4- Poor, 3- Needs Improvement, 2- Good and 1- Very Good.

Interpretation of Data

In measuring the acceptability level, the following researcher- developed scale was used: 80- 100: Very High; 60- 79: High; 40- 59: Low; 20- 39: Very Low.

Furthermore, another scale was developed to measure the difficulty level of the problems encountered along the implementation of the curriculum. The researcher ensured that a four- scale model should be applied as well in this scale for practicality and for easy to use purposes. Therefore, the maximum points of 20 was applied in this study as follows: 20- 25: Very High; 15- 19: High; 10- 14: Low; 5- 9: Very Low.

The forty- five (45) item questionnaires were administered to 101 respondents during the General PTA assembly of the senior high school since this is the only event that all stakeholders are gathered together in a single venue. Data collected were used to carry out analysis of the acceptability and difficulty of the STEM track.

Statistical Tools Used

Frequency count and percentage were used in this study in determining the acceptability level of each stakeholder as categorized as Student, Parent, Faculty or Administrator. Mean and ranking were used in finding the average acceptability level of the stakeholders as a whole and the areas in the implementation of the new curriculum that encountered major problems respectively. Finally, the significant relationship between the acceptability level of the STEM program and the difficulty level of problems encountered was determined using Pearson's Moment Product Coefficient of Correlation. According to Broto [14], Pearson's coefficient of correlation must be used in determining the significant relationship of an independent and a dependent variable. The relationship was determined at 0. 05 level of significance. This study covers S.Y. 2016-2017--- the first year of implementation of the Senior High School.

RESULT AND DISCUSSION

Acceptability Level of the Senior High School-STEM Curriculum

Table 1 presents the acceptability level of the STEM Track curriculum of Sorsogon State College Senior High School among its stakeholders. Among the stakeholders are Students, Parents, Faculty Members and Administrators of the Senior High School. In the table, it can be observed that the acceptability level of the curriculum among Students and Parents were both low while that of the Faculty Members and Administrators were overwhelmingly high and very high respectively. The acceptability scores of students and parents were 48.16 and 43.60 only while those of the Faculty Members and Administrators were 77.40 and 82.33 respectively. These results made up an overall acceptability score of 48.16 which means the acceptability level of the total respondents on the implementation of the

curriculum was low. The low acceptability among Students and Parents may be attributed to their belief that the old 4- year high school curriculum must be better than the newly implemented since the former has shorter number of years. It could also be that most parents perceive the additional two years as another burden for them since instead that their children could work already after 4 years in high school, the senior high school program would oblige their children to pursue to finish the two more years for them to be considered as graduates in the basic education. Another possible reason for this result could be the minimum knowledge and awareness of both the parents and the students about the possible employment advantages and opportunities of the senior high school program. Contrary to faculty members and school administrators who have the knowledge regarding the new curriculum since they have been exposed to several seminars regarding the K- 12 senior high school implementation, the parents and students have low acceptability of the program as compared to the former. Thus, it can be inferred that knowledge and awareness regarding the benefits of the newly implemented program was likely a cause of this finding.

Table 1. Acceptability Level of the STEM Curriculum among Stakeholders

Stakeholders	Acceptability Score (ẋ)	Remarks
Students	48. 16	Low
Parents	43. 60	Low
Faculty	77. 40	High
Administrators	82. 33	Very High
Over All	**48. 16**	**Low**

This result is similar to the study of Guerrero [15] on the acceptance of the Ubd Curriculum among public school teachers and administrators during its first 3 months of its implementation. The study showed that the acceptance level of the curriculum was very low among public school teachers, while very high among administrators. Sabaldica [16] also have the same findings in his study about the acceptability of the Basic Education Curriculum (BEC) among public elementary teachers in 2003. It can be noted that he mentioned in his study that the acceptability level of the curriculum among elementary teachers after its first 2 months, 4 months, 6 months and 1 year of implementation were very low, very low, low and high respectively. This signifies that the acceptability level of a new curriculum upon its early stages of implementation is consistently low but as intervention programs were implemented, the level increases. These results mean that majority of the stakeholders of Sorsogon State College have negative acceptability on the new curriculum. This would also mean that stakeholders perceive the new curriculum as not beneficial to students. According to Davis [17], one of the methods of ensuring the success of a certain program is to ensure the support of the people who have direct relation to it. Thus, there is a profound need to consider the acceptability of the STEM curriculum among its stakeholders.

Furthermore, the respondents also do not regard the implementation of the program essential to achieve quality education. With these results, it can be deduced that stakeholders do not totally support the implementation of the Senior High School- STEM program. This suggests that a comprehensive understanding of the significance of the senior high school program is needed among stakeholders.

Problems encountered along the Implementation of the Implementation and their Difficulty Level.

Reflected in table 2 are the findings on the different areas in the implementation of the Senior High School- STEM curriculum that encountered problems and their respective difficulty level. The table shows that among the six areas namely: curriculum, learners, faculty, facility, instructional materials and instruction, the areas that encountered major problems along its implementation were the Facility and the Instructional Materials which ranked first and second among the six areas of the implementation respectively. Although there was an existing budget allocation for the senior high school program, however the priority was allotted for other concerns in the tertiary level. This could be attributed to the fact that offering senior high school program was not a mandate of an SUC. It can also be cited that the offering of the senior high school program was only permitted by the Commission on Higher Education among SUCs for the K-12 transitional periods only since there was a predicted decline in the number of freshmen enrollees in colleges and universities . [18] Since SUCs are primarily mandated to provide quality tertiary education and not senior high school education because it is the mandate of the Department of Education, their engagement in basic education through SHS programs will be limited only

until 2021 [19] and therefore the budget for facilities was not that big as per evaluation of the SSC budget priorities. Nevertheless, the problems on the area of Facility could have been addressed through the assistance of supportive stakeholders. It can be noted that in the previous findings, the acceptability of the new curriculum was low which means the support of the stakeholders was not 100 % on the implementation of the new program. Thus, this signifies that a good relationship with the external stakeholders must be established by the school. The results reveal further that the only area that has less problems encountered and need no major improvements was the Faculty which only ranked 6th among the six areas. This may be attributed to the efficient and strict implementation of the SSC Faculty Screening and Development Program.

Table 2. Problems encountered and their Level of Difficulty along Implementation.

Areas of Stem Program	Difficulty Score (ẋ)	Remarks	Rank
Curriculum	17. 40	High	3
Learners	15. 58	High	5
Faculty	10. 84	Low	6
Facility	20. 91	Very High	**1**
Instructional Materials	20. 47	Very High	**2**
Instruction	15. 79	High	4
Over All	**16. 89**	**High**	**-**

The findings also present that major area that encountered Very High difficulty level problems were the Facility and Instructional Materials also with difficulty scores of 20.91 and 20.47 respectively. It can be observed as well that both these areas encountered Very High difficulty level of problems during the implementation of the program. Since, the budget allocation for these two areas of the senior high school program was not a priority of an SUC like the SSC, thus these findings. It must be mentioned likewise that the implementation of the SHS program was not also within the mission and vision of the institution [20].

Moreover, the other areas- Curriculum, Learners, and Instruction encountered high difficulty level problems with difficulty scores of 17.40, 15.58 and 15.79 correspondingly. The possible reason for the result on the area of Curriculum could be the inexistence of a comprehensive academic manual for both students and teachers where the course description of the subject areas, the course requirements, their number of units, and their prerequisite subjects are clearly defined. Although these pieces of information are readily downloadable on the website of the Department of Education, the students still look for a tangible curriculum guide that is accessible by everyone. This culture of students with a copy of their academic manual can be attribute to the strong implementation of this matter in the Laboratory High School (Junior High School)of the institution where every student has the full access on all their academic records through individual copy of student handbook, academic manual, and curriculum guides. Likewise, for the area of Learners, the possible cause of the High difficulty level of the problems encountered during the implementation of the program could be the exemption of some students to undergo the Student Admission Policy and the inexistence of a Student Retention Policy for Senior High School- STEM Students.

It must be mentioned that although an admission test had been administered to qualify STEM Students, this was done only for students who were junior high school completers from other schools excluding the students of SSC Laboratory Junior High School. Since total absorption of junior high school completers was applied and no qualifying test was conducted to screen this group of students, 67 out of 178 or 37.64 % of the total number of enrollees were accepted in the Science, Technology, Engineering and Mathematics (STEM) Track of the school. It is also possible that these unscreened students do not have Investigative remarks in their NCAE results which must be the primary consideration in choosing the STEM Track in career plotting. Because of these reasons, it was not a surprise that most of these students got lower grades in core mathematics subjects namely Pre- Calculus, Basic Calculus, General Mathematics, and Probability and Statistics.

Furthermore, for the area of Instruction, since there were existing problems in the areas of Facility, Instructional Materials, Curriculum and even Learners, thus the results. Another possible reason could be the lack of training of some of the faculty members of the SHS program. Out of seven faculty members, only two attended a training- seminar prior to the start of the school year in preparation for the full- blast implementation of the K- 12 SHS Program. It should also be mentioned that for the two semesters, no seminar or training for SHS faculty was held as compared to their public school counterparts who enjoyed a number of conferences and trainings which

contributed to the preparedness of their faculty in offering senior high school program.

On the other hand, only the area of faculty was perceived by the stakeholders to have low difficulty level problems with difficulty score of 10. 84. In the entirety, the difficulty level of problems as perceived by the stakeholders was high with overall difficulty score of 16. 89. The results suggest that improvements on areas of Curriculum, Learners, Facility, Instructional Materials, and Instruction must be done.

Correlation of Acceptability Level of the Curriculum and the Difficulty Level of Problems along its Implementation

Based on the results of the perceived acceptability and the difficulty level of the implementation of Sorsogon State College Senior High School- STEM curriculum, the two variables were correlated using Pearson's Product Moment Coefficient of Correlation. The computed value of Pearson r was - 0. 77 (negative) which means there is moderate inverse relationship between the acceptability level of the curriculum and the difficulty level of the problems. The computed Pearson r is shown in table 3 below.

Table 3. Pearson r and t- value of Acceptability and Difficulty Level

Statistical Basis	Statistical Analysis
n	101
df	99
r- value	-0. 770
strength of relationship	moderate inverse
t- value	12. 01
t- critical value	1.671
decision	reject
remarks	significant

Since the computed t- value 12. 01 exceeded the critical t- value 1. 671, the null hypothesis is rejected. Considering this result, it can be deduced that the acceptability level of the STEM curriculum is significantly related to the difficulty level of the problems encountered along its implementation. The findings mean that as the acceptability level of the STEM Track among stakeholders increases the difficulty of the problems encountered in the implementation of the program decreases. This suggests that the difficulty of the problems was high since the acceptability of the program was low.

Proposed Interventions

After determining the different areas in the implementation of the Senior High School- STEM Program of Sorsogon State College that encountered major problems and have high difficulty level, several interventions were developed to address the problems.

For the area of Facility, an Inter-departmental Facility Utilization Policy (I-FUP) among the three departments of the college was developed and proposed. The proposed policy aimed to address the problem of lack of facility of the senior high school program. Specifically, the goals of the proposed intervention were: (1) provide facilities needed in the implementation of the senior high school curriculum so as to satisfy the authentic needs of the learners, (2) maximize the resources of Sorsogon State College thru utilization of existing facilities of the institution, and (3) ensure quality instruction by providing educational facilities without spending beyond the capability of the institution. Through this policy, the institution could save a large amount of resources since instead of allotting separate budget allocations for the facilities of the senior high school program, the existing facilities of other departments will be utilized.

For the area of Instructional Materials, a Short Training Course on Instructional Materials Making for Senior High School Teachers was conceptualized and proposed to the administrators of Sorsogon State College. The primary goal of this intervention was to address as well the problem on lack of instructional materials especially textbooks for senior high school. Specifically, the proposed intervention aimed to: (1) provide instructional materials needed in the implementation of the senior high school curriculum and thereby address the present needs of both the institution and the students, (2) maximize the resources of the institution by asking the expertise of the faculty members in the development of quality instructional materials for senior high school, and (3) save a large amount of resources of the institution by asking the assistance of the external stakeholders specifically the PTA in the production of the instructional materials. In this proposed intervention, the problem on instructional materials would be solved and the strong bond between the institution and stakeholders would be reinforced as well.

For the area of Curriculum, a separate Academic Manual and Student Handbook for Senior High School was recommended to be proposed. These proposed materials would clearly define the subject areas, course descriptions, number of units, course

requirements and the prerequisite subjects of the students who are taking the Science, Technology, Engineering and Mathematics (STEM) Track. Specifically, this aimed to: (1) provide a comprehensive curriculum manual for students, teachers and other stakeholders where the nature and components of the subject areas are clearly defined, and (2) settle all academic concerns about the implementation of the senior high school program thru the proposed manuals.

For the area of the Learners, an efficient implementation of the Student Admission and Retention Policy was proposed. In this proposed intervention, it was recommended that all applicant enrollees for the senior high school- STEM program must undergo the Admission Test or at least must have the Investigative remarks in their NCAE Results to ensure that the students who take the STEM Program are really qualified, since according to studies[21], failure to do this would only increase the problem on low cohort survival rate, and thus might increase the dropout rate due to mismatch of the student's interest and choice of track. Specifically, this proposed intervention aimed to: (1) ensure the welfare of the students by safeguarding that the track they are to take in senior high school is in line with their ability and interest, and (2) secure quality graduates of the senior high school program by admitting only qualified students in the STEM Program.

Finally, for the low acceptability level of the implementation Senior High School- STEM Curriculum, a series of Re- Orientation about the K-12 STEM Curriculum among Stakeholders was conceptualized and proposed. A series of mini-seminars or re- orientation sessions about the K- 12 senior high school program must be done among stakeholders especially for parents since it was found out that the acceptability of this group of stakeholders was very low. In this regard, prior to the conduct of these activities, access of the faculty members in national and international seminars and conferences regarding the implementation of the SHS program must be maximized. The purposes of this proposed intervention were: (1)to increase the acceptability of the Senior High School Program among stakeholders and thereby decrease the difficulty level of problems encountered along its implementation thru constant collaboration with these partners of the institution, (2)to raise the awareness of the stakeholders and the community about the significance of the K-12 Senior High School Program, (3) to develop strong relationship among the stakeholders of the institution, and (3) to address the academic concerns and problems of the school and the students thru the direct involvement of the stakeholders and the community.

CONCLUSION AND RECOMMENDATION

Based on the foregoing results and findings of this study, the following conclusions are drawn: (1) The acceptability level of the Sorsogon State College Senior High School- STEM Curriculum among stakeholders is low; (2) The difficulty level of the problems encountered is high and the major areas in the implementation of the Senior High School Program that encountered very high difficulty level were the areas; (3) There is a significant inverse relationship between the level of acceptability of SSC Senior High School- STEM Curriculum among stakeholders and the difficulty level of problems encountered by the school along the implementation of the curriculum.

The following recommendations are presented by the study: (1) A series of information-dissemination programs like seminars and conferences for stakeholders about the K + 12 Senior High School Program be conducted so as to raise awareness and appreciation of the significance of the STEM curriculum; (2) The proposed intervention programs for the areas of Facility and Instructional Materials be given priority in the allocation of fund and in school improvement plan for Senior High School and be implemented starting in school year 2017- 2018; (3)The identified problems on the areas of Facility, Instructional Materials, Curriculum, Learners, and Instruction be addressed urgently thru the proposed interventions of this study; (4) Consultation and maximum involvement of the stakeholders in the decision- making process of the school policies and programs be encouraged and; (5) An ex post facto study focusing on the causes of the Very High difficulty level of the problems encountered be conducted; (6) An in-depth analysis of the factors that caused the low acceptability of STEM Track be included in the methodology for a future study which is the limitation of this study.

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