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Evaluation on the Support Systems of STEM Strand by SHS Graduates in Leyte Philippines

필리핀 레이테 SHS 졸업생의 STEM 과정 지원 시스템 평가

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Abstract

The learners are the core of the learning and teaching process. They are the important priority that guides the educational institutions to come up with significant directives and policies. The implementation of the K to 12 curriculum has brought an essential alter to the system of education in the Philippines. This study has evaluated the impact on the different support systems which are the curriculum, teachers, learning environment, and learning resources in the execution of the senior high school particularly the STEM strand or Science, Technology, Engineering, and Mathematics and the academic performance of the 65 senior high school graduates. A structured google survey questionnaire was employed to gather information. The study considered the descriptive correlational approach to evaluate the level of significance of the support systems and perspective of graduates on STEM strand and academic performance. The results of the study revealed that only the curriculum has a significant relationship with academic performance. However, it has also been found out that the different support systems have a significant relationship with each other. As they need support from one another in the fulfillment of the best educational system. It has found also that the learner's perspective towards the STEM strand does not affect their academic performance. On the other hand, it attested that the STEM strand of the curriculum itself is gender-sensitive. It is implemented fairly with no gender favoritism and no gender discrimination.

Keywords: *STEM, Curriculum, Teachers, Learning Environment, Learning Resources, Academic Performance*

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Chapter 1. Introduction

1.1. Background of the Study

Learners are important actors in the realization of an educational mission and vision. They are the core that guides those educational institutions to come up with different but significant directives and policies. Their needs are the main goal that any school would like to achieve. Providing them with conducive rooms and adequate learning materials cannot guarantee a quality outcome. They should be led to the path they are capable of and should become valuable citizens of the country as they are considered the hopes of the next generation. Therefore, these learners must be properly addressed with the necessary skills in moving to the next ladder of their education.

The importance of education in achieving economic growth has been well documented. High-quality education, as mentioned in an ADB 2015 report, isn’t only a "road to chances, but a requirement for victory." However, in recent years, the Philippines' educational standard has deteriorated. The National Achievement Test (NAT) results from 2008 showed that Filipino students have poor performance of Science (46.7 percent) and Mathematics (42.9 percent). Moreover, the nation's human capital’s competitive primary shows to be eroding. The country in 2014 ranked third among ASEAN countries stipulated in the present average years of schooling (8.9). However, in 2015, it fell four places to rank seven.

According to early research (Hunt, & McHale, 2005), the Philippines' 10-year system forces Filipino pupils to absorb a similar academic subject in a shorter amount of time than their international counterparts. Similarly, various assessments on the condition of education in the Philippines have continuously recommended

that the country's basic education be extended, citing the existing system's ineffectiveness lack of preparing pupils for real life. Education has received the greatest amount of publicity around the world because it determines the future of any country. In the world, only three nations have implemented a 10-year pre-university program, and the Philippines was the last in Asia to do so (Yap, 2011). The Philippines Educational System transitioned to a contemporary and more diversified curriculum after a 12-year plan to align the country's curriculum to meet the needs of the global economy, where excellent education has become a requirement for everyone.

The Philippines' educational reform, which involves extending basic education from ten to thirteen years, is supported by a lengthy history of academic studies that have highlighted the problems with the educational system of the country and the inefficiency of the ten-year framework of education. A survey of the condition of education in the country was conducted as early as 1925. The secondary schools do not efficiently prepare the learners for situations in the real world, leading to necessary training for industry, trade, and agriculture according to Monroe Survey.

One of the most significant evolution in the country was the establishment of the K to 12 Basic Education Program. It introduces programs aimed at expanding and improving the country's basic education delivery. It aims to provide Filipino learners with the required skills and knowledge to meet the defiance of the twenty-first century. It will bring basic education up to worldwide standards by making sure it is suitable, responsive, and relevant to the learners. The country's development needed to incorporate Republic Act 10533, also known as the K to 12

initiatives, into the Philippine Basic Education curriculum (Abueva, 2019). This curriculum will equip a generation of graduates with not just information, but also skills that will be crucial to their day-to-day experience and long-term growth (Mohammad, 2016).

The Republic Act 10533 or the Enhanced Basic Education Act was promulgated into law in 2013 to overhaul the Philippines' education system. The aim of RA 10533 was to develop the educational system of the country by strengthening the curriculum. The Senior High School (SHS) programs, added two grade levels which are Grade 11 and Grade 12 that make obligatory pre-college education 13 years, is a key feature of this rule. The SHS program, which began in 2016, aims to build students who are holistically matured, emitted with 21st-century abilities, and ever ready for the future, whatever career they would proceed, which may include further studies, middle-level skill development, entrepreneurship, or employment.

The Senior High School program is DepEd's initiative to the continual development of quality assurance, accreditation, credit transfer, and acknowledgment for a national system of learning routes throughout the subsystems of the Philippine educational system. Using the Senior High School (SHS) curriculum, the Department of Education (DepEd) can construct equivalent qualifying standards. The SHS curriculum offers four academic tracks, arts, and designs, sports, and technical-vocational-livelihood (TVL) (DepEd No. 21, s. 2019). And students are expected to enroll in the track of their choice.

This study concentrated on STEM which is one of the strands belonging to the academic track. The students who are inclined toward, or have an aptitude for

math, science, and engineering may enroll in this strand. Regarding two key curriculum areas, physical science and earth life science, the STEM strand has a unique arrangement. Fundamental themes in physics and chemistry are covered in physical science, whereas basic issues in biology are covered in earth and life science. Furthermore, this strand offers preparatory mathematics subjects for engineering-related programs such as pre-calculus and basic calculus. Pre-calculus aims to teach learners to solve real-world problems using analytic geometry, series, and mathematical induction, and trigonometry, whereas basic calculus teaches learners in computing the function's limit, differentiating and integrating trigonometric, logarithmic, exponential, and algebraic functions in one variable, and solving real-world problems which involve continuity, extreme values, related rates, population models, and areas of plunder (DepEd Order No. 21, s. 2019).

STEM education stimulates creativity, productivity, and economic growth making it very essential for those who pursue the STEM profession and for every 21st-century citizen (Albion, & Ting, 2014). STEM education propels the development and security of quality of human life, thus, has a serious role in modern civilization (Petroski, 2010). In its current form, STEM education is viewed globally as an integrated system of courses to explain and justify a certain occurrence. Wilson (2020) cited some significance of STEM. STEM teaches students the abilities they'll need to succeed in an increasingly complex, rapidly changing technology world. STEM education is meant to foster the type of innovation that will keep our economy afloat. A robust STEM knowledge base is required for creativity and science literacy. STEM is important because it touches every facet of our lives. Science may be found throughout the world, and it is used

to impact people and all other living creatures.

Science, technology, engineering, and mathematics (STEM) have a privileged position in modern society because of their critical role in fostering and maintaining economic development. Over the last decade, there has been a renewed national focus on STEM education, fueled in part by fears that there would be a scarcity of people equipped to meet the predicted rise of STEM employment (National Academy of Sciences, 2007). This scenario is greatly seen in the country especially since the Department of Education has just implemented the additional two years which is the senior high school. Then, to represent the country's shifting demographics, it's critical to enhance worker diversity. The improvement of undergraduate retention and graduation rates, as well as the increased entry and graduation of minorities from STEM graduate programs, are two ongoing difficulties for the United States in educating the next generation of STEM majors (US Census Bureau Report, 2014). The senior high school graduates of STEM are being prepared in the field of works that could support the demand of the country’s advancement in terms of digital and technology capabilities.

The Department of Education (DepEd) states that from the 1.2 million graduates of senior high school as of the end of the school year 2017 – 2018, around half were expected to proceed to college. This calls the attention of this study if these graduates were able to be given proper preparation in terms of the curriculum, facilities, equipment, learning materials, and right teachers in the school. On the one hand, their academic performance through their general ratings will be correlated to the rating of the different aspects of STEM as a strand. And more importantly, it has to determine how STEM implemented equal accessibility

in participating and pursuing these related programs in terms of gender. Estonanto (2017) explained that STEM is planned to encourage secondary-level graduates to enroll in science-related courses at the tertiary level. Furthermore, Sarmiento & Orale (2016) discovered that the SHS – STEM track in the Philippines is better than that in Japan and the US. Cabansag (2014) revealed that STEM would prepare graduates for a better occupation abroad. This will generate competent learners of the 21st-century skills, who are essential and social progress of the country.

SHS - STEM curriculum is aimed to help students improve their abilities in solving basic to complicated problems in their communities and throughout the world, as well as in science, technology, engineering, and mathematics ideas. It also aims to educate pupils for college and future careers as scientists, technology specialists, engineers, mathematicians, programmers, science and math instructors, and other related fields (Estonanto, 2017). The foundation of this strand is heavy on analysis, critical thinking, and mathematical computations. Thus, students may enter careers in engineering, health and medicine, architecture, IT, and other technology-related math-based foundations programs.

The Philippine government recognizes STEM education and vocations' ability to fulfill the needs of the looming technology revolution, which will eventually affect citizens' quality of life. In reality, most first-world countries feel that STEM education will help them develop talented people resources and increase their economic power (Wise, 2015). Developing nations, such as the Philippines, have a similar ambition based on a similar worldview, stressing STEM Education as a path to innovation and growth (Padolina, 2014; Ahmed, 2016).

Choosing a career is extremely important, particularly for students in

secondary or middle school. When it comes to career choices, one must go through an intricate process and be a forcefully open-minded individual to choose his profession, practice, sex, personal interests, and connections. All of these factors affect student career choices (Edwards, & Quinter, 2011). Even though learners are supposed to become the next generation and have dreams for a better future, there is always the possibility that the curriculum they select would not be their choice and would only lead to misinformation. According to research, attrition in STEM is caused by a combination of educational disadvantages rather than a lack of enthusiasm in science. Failures (of student learning, insufficient instruction, poor school budget, and so on) might impede students from gaining the prerequisite information they need to grasp the topic and remain engaged (Sasso, 2008).

This study has emphasized the participation of males and females in STEM-related programs. The enrolment of females in STEM may outnumber males, however, consideration on how many of the females would continue the STEM-related programs in college is another matter to look into. If high school math course attendance is a case of gendered equifinality, determining the main factors that contribute to the congruency of outcome will reveal insightful information on how to represent boys and girls on their best efforts in the classroom. It would also molt the light on a crucial developmental era: the chance leading up to high school achievement and graduation, which affects the transition to adulthood.

This study had focused on the impact of the different support systems in the implementation of the STEM strand on the academic performance of the learners especially in preparing them to pursue STEM-related college programs. On the

other hand, the learner graduates who didn't take the aligned programs had been evaluated. It tried to look into the assumptions that the STEM strand also shows gender differences. These senior high school graduates as respondents of the study were tracked on their status whether they have pursued related STEM programs in college. Secondary education is the stage of basic education at which students are required to master intellectual as well as certain practical courses. The students are expected to take the first nationally recognized test, which will lead to higher education in a variety of professions or direct employment (Koech, 2006). The ultimate goal of this segment is to achieve the goal of giving equal chances to all learners for a minimum of 12 years of schooling so that at the end of basic education, each learner would have received critical education for future life choices.

Thus, this study evaluated that the academic performance of the SHS learner graduates may have been affected by the support systems implemented by the K to 12 particularly the STEM strand. Although the gender of the learners is a considerable variable in the study. However, according to Mann & DiPrete (2013), combined data on the contribution of STEM level by gender hides many similar patterns. Firstly, women comprise larger in number than men study at the higher academic level and earn degrees in college, and the advantage of females has grown even college's degree parity was reached in 1982. Despite this, women proceed to consider non-STEM degrees to STEM degrees; the elevated proportion of STEM programs recognized women's desire and persistence of females to prefer non-STEM majors. Secondly, since 1980, the quantity of male students pursuing STEM programs has fluctuated; the number of male STEM programs fell sharply

in the late 1980s before increasing again in the 2000s. The male pattern shows that their factors come from the external force that influenced STEM majors' attractiveness. Thirdly, both males and females became more interested in biological sciences in the early 1990s. For the last two decades, women have been overwhelmingly pursuing biological science degrees among STEM majors. As a result of these developments, the percentage of biological science degrees to women's recognition has risen from 40% to 60% in the last 3 decades. Around the same time, the participation of women in engineering and physical science degrees has decreased over the past years. The division of gender is the most pronounced in the programs of engineering, where women have never earned a quarter of all degrees awarded. In other words, the superiority of females in STEM degrees is limited to biological sciences; in physical sciences and engineering, the male advantage remains.

Academic performance, also known as an academic accomplishment, is the degree to which the learner meets his or her short- or long-term educational objectives, and it has long been an important component of every student's, teacher's, and professional's educational background. Although education is generally performed under the supervision of educators, learners can also educate themselves, indicating that students' performance is influenced not just by their teachers, but also by themselves. Every educational institution's most precious asset is its students.

The Philippines was ranked second-lowest in Mathematics in the Program for International Student Assessment (PISA) according to the 2018 assessment, with low performance in advanced courses such as Calculus. Hence, this study

assumes that there would have been factors why these learners have achieved a low performance in calculus. Furthermore, as calculus is one subject offered in the STEM strand it is therefore right to look into how the learners are being taught and how they perceive the strand.

Low academic performance and college adjustment are not new issues in worldwide educational institutions. According to Sahin, Arseven, & Kilic (2016), students who are unable to form positive connections with their peers, instructors, and school administration, as well as students who dislike school and topics, are more likely to drop or be absent from school. The difficulty of assimilating to the school curriculum, according to Fan & Wolters (2012), is one of the particular causes of school dropouts. Many academics have claimed that the learning environment is one of the reasons which may affect students' academic accomplishment, including test results (Ajayi, Haastrup, & Osalusi, 2010). Before the country's military administration, the relevance of the learning environment to educational growth was so strongly emphasized by the authorities and regulatory entities that school inspectors were an integral component of the educational system. The learning environment is still an essential topic that should be researched and handled well to improve students' academic performance. The teaching-learning process, which includes classroom planning, administrative planning, circulation planning, spaces for conveniences planning, and general infrastructure design, is critical for both instructors and students. The location of pupils within the school grounds, the structure of their classroom, and the availability of educational resources and equipment all influence how well they learn. A school with an ideal learning environment is thought to assist stir up

projected learning outcomes that would encourage great academic success by enabling effective teaching and learning.

Without students, universities and colleges are nothing. The academic performance of learners is critical in developing the best possible alumni who will become leaders and service providers in a given nation, and therefore responsible for the social and economic growth of the nation (Ali, 2013). In previous studies, the academic achievement of pupils has gotten a lot of attention. Though the aforementioned components have a significant impact on student achievement, they range from nation to country and person to person (Singh, 2015). The majority of prior research on student academic performance centered on problems such as education of the teachers, class environment, gender differences, teaching style, family educational history, and socioeconomic factors.

Education in the STEM strand is increasingly being acknowledged as important in promoting the advancement and driving the mechanism of future economic growth in the Philippines. The K-12 program now concedes SHS learners to pursue STEM-related careers through the academic track, to increase the number of graduates who will pursue scientific and mathematics-related programs at the college level. Hence, to attain this pursuit, significant endeavors are being undertaken to improve the interest of the learners in these areas as well as the quality of the teachers. According to data from the World Economic Forum, the Philippines' mathematics and science education are among the worst in the region, resulting in a low number of STEM graduates. In 2016, 76,423, or 12 percent, of the 645,973 university graduates received a degree program in engineering, 6828 (1 percent) were graduates in science, and 2736 (0.4 percent) were graduates in

mathematics. While those who sought science and technology programs either stay in urban areas – most of them (34%) live in Metro Manila and the adjacent to the Calabarzon regions (25%) and Central Luzon (7%) – or migrate overseas to explore possibilities.

This study was concerned with the relatedness and preparedness of the learners and graduates of STEM strands in taking aligned programs and their academic performance. This research assumed that the support systems of STEM of this strand may affect the performance of the graduates. It looked further at the impact of these support systems on senior high school graduates. In this sort of transition, the goal is to prevent both scarcity and an excess of schools, instructors, and supplies.

1.2. Research Questions

The purpose of this thesis was to evaluate the impact of the Science, Technology, Engineering, and Mathematics (STEM) strand on the senior high school (SHS) graduates in the school year 2019 – 2020 in Area I of the Leyte Division, Leyte, Philippines.

Certainly, it tried to seek the answer to the following research questions;

1. What are the profiles of the senior high graduates in terms of the following:
    a. sex;
    b. age;
    c. school where STEM strand was taken;
    d. preference of taking college program

e. program took in college;

f. relatedness of the program to STEM strand; and

g. preparedness of taking STEM-related programs;

2. What is the academic performance of the senior high school graduates for the school year 2019 – 2020?
3. What is the perception of the SHS graduates of the STEM strand towards the following support systems:
   a. curriculum;
   b. teachers;
   c. learning environment, and
   d. learning resources?
4. What is the learner's perspective on the STEM strand?
5. Is there a significant relationship between the support system of the STEM strand as perceived by the graduates and their academic performance?
6. Is there a significant relationship between the graduates' perspective in the STEM strand and their academic performance?

1.3. Hypotheses

This study assumed the following results:

1. There is a significant relationship with the support system (curriculum, teachers, equipment & facilities, and learning materials) of the STEM strand as perceived by the graduates and their academic performance?

2. There is a significant relationship between the graduates' perspective in the STEM strand and their academic performance.

1.4. Importance of the Study

This research will prove to be beneficial to the following actors.

Department of Education. The Department of Education will be given the basis to implement new policies and guidelines concerning the needs of the learners to choose the track or strand they are going to take in the senior high school. The Department of Education's new K-12 Basic Education Program adds two years of secondary education, allowing graduates to choose from three career paths: postgraduate jobs, higher education, or entrepreneurship. The curriculum overhaul, expansion, and preparation of teachers at the outset of the program, maintaining the program's continuity, and achieving the requisite facilities were all obstacles to the change (Sergio, 2012).

Regional and Division Offices. The Regional and Division offices under the Department of education will be more encouraged and inspired to align the programs and projects that will cater to the needs of the learners in terms of preparing them to become skilled and useful citizens of the country. The offices will also strengthen the evaluation and monitoring of the performance of the Senior High School under their supervision.

School Administrators. The different district administrators and school principals will become more concerned about the assessments of the learners in terms of preparing them to become citizens who are significant individuals. Additionally, the opening of other tracks and strands to schools will become a priority.

Teachers. Teachers should be trained and be inspired to pursue studies in graduate schools since it will be a top priority to provide learners with quality education.

Learners. The learners as the core of the educational system will be given the freedom and the chance to select the preferred track or strand, they want to pursue in the senior high and tertiary education. Likewise, relevant and timely skills and knowledge will be integrated into them.

Parents. The parents of the learners will be more passionate about the needs of their children as they will allow their children to pursue the career they aspire in senior high school and most of all in college. They will become motivated to engage in the school's activities, programs, and projects.

Researchers. Researchers who will conduct similar studies would be given insights relative to the study at hand, and that they can conduct further studies about what has already been studied.

1.5. Scope and Delimitations

The study had focused on evaluating the impact of the STEM strand in terms of the different support systems such as curriculum, teachers, learning environment, and learning resources to senior high school graduates. Likewise, the learner graduates' perspective will be determined to correlate with their academic performance during the school year 2019 - 2020. This was also concerned whether the STEM strand had been gender-sensitive to the learners. Furthermore, it looked into the significance of the strand in preparing the learners to take STEM-related programs in college.

The Google survey form was utilized to gather the needed data however,

the validity and reliability of the study were highly considered. The survey had strictly considered the learner-graduates who graduated in STEM strand from the two identified schools offering the strand. It tracked the alignment of the learner's program taken in college to the STEM strand. In this manner, the study sought to determine how prepared the learners to take the STEM-related program in college.

Respondents in the survey were senior high school learners who graduated in the school year 2019–2020. The quota sampling method was applied to attain the standard results. This group of learners who graduated in STEM strand have come from the two senior high schools which are Alangalang National High School and San Miguel National High School in Area I of the Leyte Division, Philippines. The study had only focused on the perceptions of the graduates towards the impact of the different support systems. Although the respondents have greatly participated in sharing their perceptions, the study still tried to consider some possibilities of being biased. However, it tried to explain anticipated queries that may arise along the way. One example, the study only utilizes the participation of the STEM graduates to evaluate the impact of the different support systems that may be given different views to other graduates from other strands. Hence, it encourages future researchers to contemplate this matter.

Chapter 2. Review of Related Literature and Studies

This section reviews a summary of relevant literature and existing studies the researcher believes are of significant value to the study. The various materials are discussed in sufficient detail.

2.1. Related Literature and Studies

The "K-12 curriculum" is a substantive educational reform proposal in the Philippines. The country is intruding to belong to the global norms with this adjustment. The strategy addresses the major difficulties of higher education preparation, eligibility for entering local and international higher educational institutions, and accessibility to employment after graduation (Okabe, 2013). Significant increases over the traditional 10-year basic education are predicted with revisions to the school system's structure, curriculum, and philosophy.

According to Padernal & Diego (2020), senior high school learners' academic performance in Pre-Calculus was typically average, independent of their school of origin or admission examination results. Academically, learners fared well in angles and triangles, low in right triangles, and average in other areas, depending on their school of origin. Furthermore, based on their entrance examination scores, learners obtained exceptional academic performance in the subject of angles and triangles and average academic performance in other areas. The relationship between the school of origin and academic achievement in Pre-calculus was not significant according to the statistics. The outcomes of entrance examinations, on the other hand, have been proven to have a strong link to academic achievement. Finally, the findings revealed that entrance examination results are a good predictor of academic achievement in Pre-Calculus.

A large number of out-of-school children Albert (2016) has also been linked to the Philippines' poor performance in basic education. According to Albert (2016), economic, health, and psychological factors impact out-of-school learners in the country. As a consequence, 36 percent and 44.1 percent of learners at the elementary and secondary levels, respectively, stated a “lack of personal motivation

and enthusiasm" as a cause for not going to class. Similarly, at the elementary and secondary levels, 34.7 percent and 12.4 percent of pupils, respectively, cited "sickness or handicap" as a reason for missing school. Furthermore, "high education costs" were indicated by 14.1 percent and 29.4 percent of respondents, respectively, as a reason for not attending elementary and secondary school. Given the significance of basic education in creating a better-prepared workforce, research suggests that the Philippine government should develop a comprehensive plan to address the country's declining school attendance. The researcher believes that these were just some of the many factors that pulled down the academic performance of the learners in both elementary and high school learners.

The new English curriculum, according to Barrot (2018), is out of step with traditional language teaching and learning approaches. According to Barrot (2018), as a new curriculum, K-12 must develop its uniqueness, inner coherence, and integration of several essential 21st-century learning and language teaching ideas. Furthermore, Relucio & Palaoag (2018) revealed that the K-12 curriculum had an overall negative response from learners utilizing a sentiment analysis of learners' different posts on social media. The findings of Relucio and Palaoag (2018) may assist to explain why many stakeholders (such as children, parents, and teachers) oppose implementation. While the reform's aims are encouraging, research suggests that the government and politicians will need to simplify the process even more and evaluate the K-12 curriculum if it is to be implemented successfully promptly.

Women are bombarded with subtle (and not so subtle) signals that they do not belong in STEM fields, especially mathematics, engineering, computer science,

and physical sciences. Women's success, commitment, and dedication in STEM fields are hampered by their feelings of belonging, which cause them to wonder if their abilities, desires, and goals are consistent with STEM. One approach to strengthen women's sense of identity is to change the social environment within STEM majors. The gender makeup of engineering teams has an effect on female students' attitudes, thoughts, and behavior during teamwork. Female college students who were randomly assigned to teams with a female minority (25%) were less optimistic and engaged in teamwork, reported feeling more unsure and worried, and talked less than female college students who were randomly assigned to teams with a female majority (75%) (Dasgupta, & Dennehy, 2017).

Few academics have attempted to recognize the present state of K-12 perpetration in the Philippines in the existing studies. Rivera (2017), for example, observed a misalignment of instructional pedagogies and performed a thorough evaluation of the Philippines' curriculum which is K-12. The study concludes that an in-depth examination of the content's curriculum is essential for the improvement of more effective pedagogies. Additionally, Trance & Trance (2019) looked at a variety of teacher and student experiences to learn more about how they handle the K-12 curriculum. The investigation discovered a disconnect between the instructors' and learners' perceptions and the program's requirements.

The aligned teaching approach guarantees that teachers are given desired objectives in terms of outcomes, which students must demonstrate by demonstrating that they have attained those outcomes throughout the assessment phase. The teaching strategies must then encourage or lead pupils toward achieving those objectives. Finally, the assessment processes will have been completed to the

point where the level of achievement of the specified goals may be judged. As a result, the grade must represent the level of understanding of the concept (Biggs, 1999). Teaching must be aligned to create learning. These are the teaching materials, the teaching methods, the assessment processes, the atmosphere fostered during the interactions with students, and the institutional climate: the rules and procedures that are allowed.

Perceptions of the teacher's role might differ from person to person. Since there are individual differences, teaching quality, or outcome of learning-focused activities as both teaching setting and student involvement, it may be discussed with instructors' thoughts on how learning is obtained as a result of students' efforts. Recent research has shown that instructor quality (literary abilities and professional experience) has a beneficial impact on student accomplishment, even outweighing the benefit of reduced class sizes (Rivkin, Hanushek, & Kain, 2005). Rivkin and his colleagues observed that increasing the teacher quality distribution by one standard deviation resulted in greater achievement increases than lowering class size by ten pupils. The findings for teacher experience "confirm the concept that starting teachers, and to a lesser degree second year and third-year teachers, perform much worse in mathematics than more experienced instructors" (Rivkin, Hanushek, & Kain, 2005). For both Math and English, additional advances in later years were minor and not statistically significant. The experiment also demonstrated the relevance of teacher quality by highlighting the wide range of student achievement within a single school (Hanushek, 1971). Finally, (Sanders, & Rivers, 1996) revealed that the effect of teacher quality on performance was cumulative, as students who were repeatedly allocated to poor teachers performed

worse than students who were repeatedly assigned to competent teachers.

The supply of education to the populous of such countries is the key to long-term prosperity, peace, and stability inside and between countries. The availability and accessibility of learning resources improve the efficacy of schools since they are essential elements that can help students achieve good academic results. According to (Maicibi, 2003), all institutions or organizations are made up of human individuals (workers) and other non-human resources. As a result, every organization should make an effort to recruit and retain the greatest human resources. These viewpoints imply that well-trained mathematics teachers if properly deployed in secondary schools, will produce well-rounded kids who will excel academically in mathematics.

The various studies presented how academic performance plays in evaluating variables such as the course program, self-regulation, and national examination. This study prioritized the evaluation of the STEM itself as a leading strand that beliefs to address the sluggish growth of the technological and medical fields of the country.

2.2. Theoretical Framework

This study believed that the different support systems in the implementation of the Science, Technology, Engineering, and Mathematics strand in the Philippines had given the graduates the right preparation to track their career on the right path which are STEM-related programs in tertiary education. The number of participating females enrolling in the STEM in senior high school may

not necessarily be that females can already access easily to the male-dominated programs in college. The academic performance and perception of the graduates were utilized to evaluate the STEM strand. On the other hand, this study still holds the theory that females of this generation already adopted the demand of the society that girls can show their talents and skills where they feel good and best at. Hence, it has sought to determine the impact of the STEM's support system on the learner-graduates of the senior high school.

Based on the role of congruity theory (Diekman & Eagly, 2008), the basic social functions provide an incentive system that people negotiate as they work against their goals. As a result, people choose particular tasks that help them achieve crucial goals, such as career or family roles. Women and more feminine people prefer working with people to working with objects, and this choice predicts different career preferences (Lippa, 1998). And after accounting for their study standards, the higher attention women put on society-oriented or people-oriented employment, the more health-related jobs they choose (Eccles, 2007). Girls who think science and altruism go hand in hand are more likely to seek scientific careers (Weisgram & Bigler, 2006). We suggested that career opportunities vary in terms of the goals they are thought to enable, based on these work congruency rules (Diekman & Eagly, 2008). We propose that women's social objective orientation traverses with the belief that STEM occupations don't need them to help or cooperate with others, prompting even technically qualified women to select other careers where they will be able to achieve their group goals.

The theory of Walberg's (1981) on educational productivity is considered to be one of the few imperially established school learning theories, based on a

study and integration of over three thousand (3,000) pupils (DiPerna, Volpe, & Elliot, 2019). The management in the classroom, support of parents, interactions between the learners and teachers, the attitudes of the learners in terms of social-behavioral, effective motivational traits, peer group, the culture of the school, and environment of the classroom were eight (8) of the eleven (11) most important categories of factors (Greenberg et. al., 2003). Background factors had less influence (e.g., state, district, or school regulations, organizational features, curriculum, and teaching). This set of variables has been modified as the most potential such social, behavioral, motivational, affective, cognitive, and metacognitive in Wang et al. research, which positively and significantly affects learner's outcomes.

Academic elitism's perspective on the mismatch between senior high school strand and college course is that only experts in the subject with extensive academic qualifications are regarded to obtain higher academic scores, enhancing the likelihood of academic success (Rambe, & Moeti, 2017). According to the idea, in highly competitive academic contexts, only people with a strong intellectual background can withstand academic difficulties such as challenging exams and projects (Mukharji, 2017). Academic elitism is particularly prevalent in highly competitive and well-regarded academic fields, such as college. According to the academic elitism hypothesis, college students, particularly freshmen, who have a good prior knowledge of the subject being taken would be able to adapt to the learning environment and get great grades. Students with a poor academic background and understanding of the selected course, according to the hypothesis, are suppressed and left behind in their academic pursuits.

Social structural theory (also known as social role theory; (Eagly & Wood, 1999) is another significant psychological theory that argues psychological gender differences are rooted in sociocultural influences such as the gendered division of labor. In cross-cultural studies, Eagly and Wood (1999) discovered significant associations between aggregate markers of gender equality and gender disparities in partner preferences, which appear to affirm social structural theory (including earning capacity, domestic skills, and age). Even though Eagly and Wood did not look at gender gaps in math, social-relational theory should be used to improve access to math education. This theory emphasizes that both males and females in the school should also have equal opportunity and access the privileges in attaining better achievement. If the cultural roles they occupy do not involve arithmetic, women may encounter institutional (e.g., formal access to school is confined to males) and social (e.g., preconceptions that math is a male domain) impediments to their mathematical growth. According to social systemic theory, gender equity in career and educational results can be connected with gender in mathematics performance, behaviors, and influence.

The vertical alignment hypothesis (Kurz, Talapatra, & Roach, 2012) implies a clear, direct, and linear link between the concepts conveyed to learners at various levels of the learning process. According to the hypothesis, students that take vertically matched curricula have higher learning results (Kagan, Caroll, Comer, & Scott-Little, 2006). A vertically aligned curriculum consists of giving students classes and courses that will prepare them for the next level of education. According to the learning progression viewpoint, teaching and learning requirements must be sequentially delivered throughout different developmental

stages, ages, or grade levels (Lee, & Liu, 2010). The learning progression is defined by the standards that must be designed to fulfill unique learning requirements and skills of children at different stages of their intellectual, emotional, social, and physical development. According to the idea, instruction is intentionally organized and rationally sequenced so that students gain the information and abilities that gradually prepare them for more difficult, higher-level tasks (Kurz et al., 2012).

The Career Counseling Service of children plays an important part in preparing students for Senior High School. The career advice consultation sessions were linked to career interests, which were used to determine the study's findings. Martinez and Fuller (1999) describe career objectives as establishing one's work schedules and duties in connection to one's abilities, talents, and competencies with the assistance of management to take more job and personal responsibility for one's future. To put it another way, this is a person's dream career choice that can be taken ahead of time. Heilbronner (2011) also claimed that a greater number of students showed an interest in taking STEM courses in college. The continuity of the learners' preparations, as well as their scholastic perspectives, all add to this. It also needs to consider that the learners today need proper guidance and counseling not only related to the behavior in the school but mostly about guiding them to track the career right for their capacities and skills.

2.3. Conceptual Framework

The variables considered in this thesis are the STEM strand and the academic performance of senior high school graduates. It looked into the

possibility of gender differences among the participation of boys and girls in this strand. The variables such as the curriculum, teachers, learning environment, and learning resources, and the learner's perspective have been utilized to evaluate the STEM strand. Including the number of females and males who took the aligned STEM programs in college. In this manner, the effectiveness of the implementation of the senior high school will be assessed.

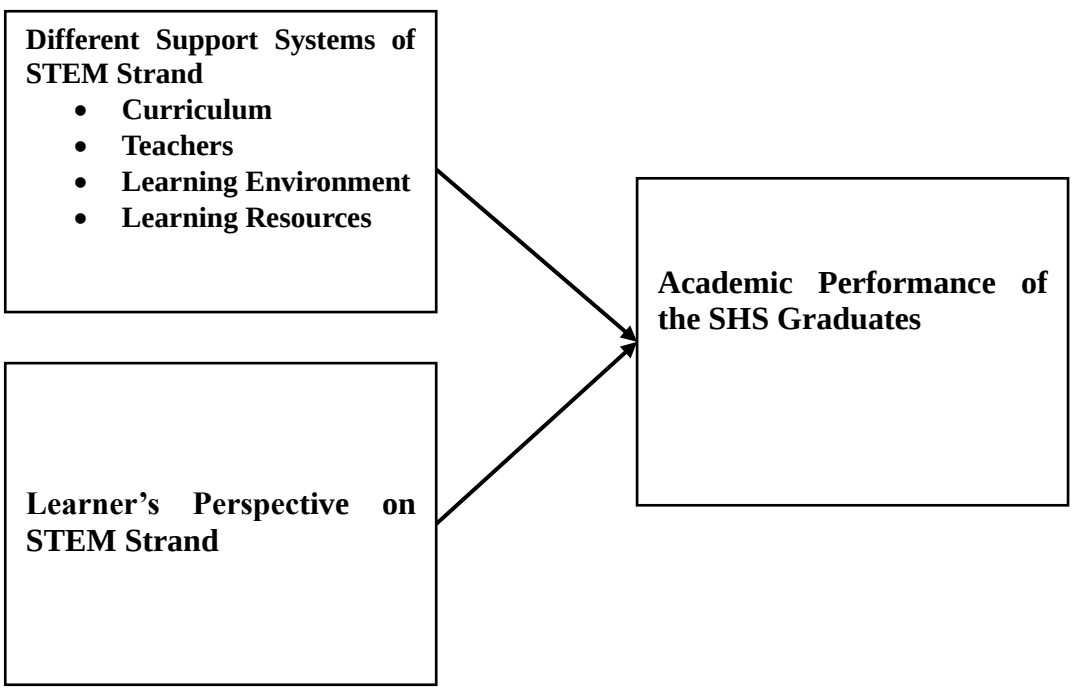

Figure 1. The relationship of the different support systems, perspectives on STEM strand and the Academic Performance

Chapter 3. Methodology

The methodology and processes employed in the study's execution are described in this section. The research design, respondents, study location and time, tools, data collection technique, and statistical analysis of the data are all covered in this chapter.

3.1. Research Design

Descriptive and correlational analysis designs are the quantitative research designs that were utilized in this thesis. A descriptive research style, according to Barrot (2018) gives a reasonably complete description of what is happening at any given moment. Furthermore, the descriptive study design is a scientific strategy that entails monitoring and reporting the behaviors of a subject without altering them in any manner (Shuttleworth, 2008). A descriptive research approach is appropriate for this analysis since the researcher would also discuss the feasibility of using the STEM strand in senior high school. Correlational research design, on the other hand, is a non-experimental research technique in which a researcher tries to look at two variables, interprets, and analyzes the statistical and significant relationship between them without employing any other variables. This design analyzes the correlation of the different support systems in the implementation of the STEM strand to the academic performance of the graduates. Meanwhile, exploring the learner-graduates' perspective and gender issues on this strand have been determined.

3.2. Research Locale

The Department of Education (DepEd) in the Philippines has been serving the country with utmost dedication and quality services to its stakeholders most especially learners. It is composed of seventeen (17) regions with 221 school divisions (https://www.deped.gov.ph/2018/11/30/deped-uno/). The Leyte Division which is under Region VIII is the biggest division in the region and one of the biggest divisions in the Philippines. The study considered two senior high schools which are Alanglang National High School and San Miguel National High School to be the locale of the study as they are the only public schools offering STEM strands.

3.3. Respondents of the Study

Students who graduated in Science, Technology, Engineering, and Mathematics (STEM) for the academic year 2019–2020 participated in this study. These students attended Alangalang National High School and San Miguel National High School in the DepEd Leyte Division's Area I in Leyte, Philippines. The STEM component was only provided at these two schools.

On the other hand, there were 65 learners considered as respondents of the study from a total of 85 learner-graduates. The researcher took one class section from every school and it totaled 85 learners. The study employed a quota sampling method (Ben-Shlomo, Brooke, & Hickman, 2013) to obtain the desired 75% sample size from the total registered learner-graduates. This method was applied as the learners are already in the different universities and colleges in the Philippines.

3.3. Research Instruments

This study utilized a google sheet survey form (https://docs.google.com/forms) to gather data from the students who graduated from the STEM strand. This instrument catered to the different important data that this study needs such as the background information of the respondents, their perception of the different support systems in the implementation of STEM strands such as the curriculum, teachers, learning environment, learning resources, the learners perspective, and academic performance.

3.4. Data Gathering Procedure

The Google survey form was used in this study to gather the data. The researcher procured a letter of consent and approval from the advisor and the Schools Division Superintendent of DepEd Leyte to administer the conduct of gathering the data. Upon approval of the permission letter, the researcher collected the data following four phases. In Phase 1, the researcher conducted a dry run on the selected learners in San Miguel National High School who are non-STEM graduates to test the validity of the survey form. For Phase 2, the data gathered from the dry – run were computed to look into the different lacking items in the survey and if it applies all the desired data. With the approval of the thesis advisor on Phase 3, the instrument has been revised and refined. Finally, Phase 4, is the data-gathering period. The researcher facilitated the administration of the survey through the linkages of the senior high school coordinators. After receiving the data, the responses were tallied, tabulated, transcribed, and treated with quantitative and qualitative data analysis tools and were analyzed and interpreted.

3.5. Method of Scoring and Interpretation

Statistical treatment of the data varies from one variable to another. The detailed descriptions are as follows.

Background Information of the Respondents. This includes the sex, age, school where the STEM strand was taken, preference of taking the college program, program taken in college, relatedness of the program to STEM strand, and preparedness of taking the STEM-related program. Each of these variables has a corresponding value to consider. For the sex, the preferred responses are, male, female, and prefer not to say. The right ages for the respondents must be 19 – 20 (https://www.quora.com/How-old-are-students-joining-college) but this study does not limit to this range only. There were only two options for the schools they took the STEM strand. These are Alangalang NHS and San Miguel NHS as the only two schools offering STEM in Area I of Leyte Division. Relatedness and Preparedness of the STEM-related college programs can be responded to as "Yes" or "No" only. On the other hand, preferences of taking the college program vary from the options, "personal choice, family, friends or peer influence, and others. Likewise, the programs taken in college may vary either, "engineering, medical, humanities, and social sciences, business, and information and communication technology." Among these responses, engineering and medical programs are aligned to STEM programs.

Academic Performance of the Graduates. To determine the academic performances of the graduates in senior high school, their average in the first semester of the school year 2019 – 2020 are assumed in the study. Below are the ranges and interpretations of the average grades (https://www.teacherph.com/deped-grading-system/):

Grades Range	Interpretation
90 – 100	Outstanding
85 – 89	Very Satisfactory
80 – 84	Satisfactory
75 – 79	Fairly Satisfactory
Below 75	Did not meet Expectation

Perception of the SHS Graduates to Support Systems and the Perspective of on STEM strand. This study assessed the different support systems of the implementation of the STEM strand such as curriculum, teachers, learning resources, and learning environment through the perceptions of the SHS graduates of this strand. The following ranges of values, together with their descriptive interpretations, will be utilized to score and interpret the replies. (https://www.simplypsychology.org/likert-scale.html):

Descriptive rating	Interpretation
4.21-5.00	Strongly Agree
3.41-4.20	Agree
2.61-3.40	Neither Agree nor Disagree
1.81-2.60	Disagree
1.00-1.80	Strongly Disagree

3.6. Statistical Treatment of Data

The researcher employed the following statistical tools: (1) the frequency and percentage of scoring, to describe and explain some of the information of the respondents; (2) the simple mean, to describe the average academic performance of

the learners; (3) the weighted mean, to determine the level of assessment or perception of the respondents towards the different support systems and their perspective to STEM strand; and (4) the Pearson r, to determine the degree of significance between the different support systems of STEM strand such as curriculum, teachers, learning environment, and learning resources, and their perspective on this strand and their academic performance considering the 95% confidence level (The Jamovi Project, 2021).

Chapter 4. Presentation, Analysis, and Interpretation

of Data

The collected data, analysis, and interpretation of findings using various statistical methods are presented in this chapter. These are provided in tables in the order of the specific study questions on the relationship between senior high school graduates' perceptions of several STEM strand variables such as curriculum, teachers, learning environment, and learning resources, and their academic achievement. Likewise, the different perspectives of the learners towards the STEM strand were also analyzed.

4.1. Background Information of the SHS Graduates

The respondents of this study were senior high school graduates of the Alangalang National High School and San Miguel National School in the STEM strand. These are the only two schools in Area I of the Leyte Division which offer STEM strands. There were a total of 65 learner-graduates who participated in the study. These respondents answered the survey form conducted during the period of gathering the data. The following information is presented below:

Table 1. The Respondents of the Study

Schools	Male	Female	Prefer not to Say	Total (f)	%
Alangalang NHS	19	18	2	39	60
San Miguel NHS	11	15	0	26	40
Total	30	33	2	65	100

Note: NHS – National High School; f – frequency; % - percentage

Of the 65 respondents that appear in Table 1, 39 come from the Alangalang NHS and 26 come from San Miguel NHS. Alangalang NHS is the biggest high school in Area I of the Leyte Division. There are 30 males, 33 females, and 2 respondents who preferred not to say their gender who participated in the

study.

Table 2. Age of the Respondents

Age	ANHS	SMNHS	Total (f)	%
17 - 18	2	1	3	4.6
19 - 20	30	20	50	76.9
21 - 22	6	5	11	16.9
23 - 24	1	0	1	1.5
Total	39	26	65	100.0

Note: ANHS – Alangalang NHS; SMNHS-San Miguel National High School

The respondents of the study who graduated in the school year 2019 – 2020 are expected to be second-year college students this year. As reflected in Table 2, most students are at their right ages 19 and 20. There are a total of 50 (76.92%) students who are at the age to study at the second-year college level. From these 50 learners, 30 learner – graduates come from the National High School and 20 learner – graduates in San Miguel National High School. While there are 11 (16.92%) students who are just one year older than the right ages. There is one learner – graduate is considered overage.

Every senior high school track comprises programs that are aligned in the programs in tertiary education or college level. For example, the learners who graduated STEM strand under the academic track are expected to proceed to STEM-related programs such as engineering, and medical programs. In this study, the respondents identified how the program they took in college is related to STEM. STEM strand is under academic track which focuses on advanced concepts and topics in science, technology, engineering, and mathematics. This strand suggests fitting learners who are reputing either sciences or engineering programs at tertiary level (https://www.edukasyon.ph/courses/senior-high-tracks).

STEM-related college programs refer to the college programs aligned to

the Science, Technology, Engineering, and Mathematics in college. This may include engineering courses, medical courses, information technology courses, and mathematics-related courses.

As reflected in Table 3, there are 43 respondents, or 66.2% who pursued college programs that are STEM-related. Among this learner – graduates there 28 from ANHS and 15 from SMNHS took STEM-related programs. Although there are 22 (33.8%) of them took non-STEM-related programs from the two schools, it still shows a great sign that most students were properly guided to proceed to programs that are STEM-related programs in college.

Table 3. Relatedness of the STEM Program in College

Response	ANHS	SMNHS	Total (f)	%
YES	28	15	43	66.2
NO	11	11	22	33.8
Total	39	26	65	100.0

Engineering and medical programs are among the programs aligned in the STEM strand. In Table 4, most of the respondents took STEM-related programs in college. There are 33 (50.77%) students in the engineering programs while 10 (15.38%) students are taking medical programs. It shows that there is a total of 43 (66.15%) senior high school graduates who took STEM-related programs in college. On the other hand, there is a total of 22 (33.85%) students who took non-STEM programs in college. In the same table, it shows that there are 14 (21.54%) students who chose Humanities and Social Sciences programs in college. There are more learner – graduates in SMNHS who took programs that are related to STEM compared to ANHS.

Table 4. College Program Taken

Program	ANHS	SMNHS	Total (f)	%
Engineering	18	15	33	50.8
Medical	6	4	10	15.4
Humanities and Social Sciences	9	5	14	21.5
Business	2	1	3	4.6
Information and Technologies	4	1	5	7.7
Total	39	26	65	100.0

Table 5 shows most of the SHS graduates have personally decided to pursue programs in college. There are 57 (87.69%) out of 65 respondents who have confirmed that it is their personal choice to take the programs in college. There are 6 (9.23%) respondents who took college programs that were recommended by their parents. However, the table reflects that most learners of this generation are more given the chance to choose the career they want to pursue in the future.

Table 5. Whose Preference of taking STEM Program

Preference	ANHS	SMNHS	Total (f)	%
Personal Choice	33	24	57	87.7
Family	4	2	6	9.2
Friends/Peer-Influence	1	0	1	1.5
Others	1	0	1	1.5
Total	39	26	65	100.0

Table 6 explains how the two schools served and guided the learners to be prepared to take the STEM-related programs in college. There are 34 (87.2%) learner – graduates from ANHS who believed that they are prepared to take STEM programs in college which is more than the 19 (73.1%) graduates in NHS.

Table 6. Preparedness to take STEM-related Program

Response	ANHS	SMNHS	Total (f)	%
YES	34	19	53	81.5
NO	5	7	12	18.5
Total	39	26	65	100.0

In so far, out of 65 senior high school graduates 53 (81.5%) of them believed that they were prepared to take STEM-related programs in college. On the other side, there are only 12 (18.5%) graduates who believed that they were not prepared to take related programs in college.

4.2. Academic Performance of the Senior High School Graduates in Science, Technology, Engineering, and Mathematics (STEM) Strand

Academic performance is assessed by determining how much has been accomplished over some time (von Stumm, Hell, & Premuzic, 2011). Academic performance is measured by a cumulative GPA and the fulfillment of educational milestones such as secondary diplomas and degree certificates. Academic achievement is a key factor of retention and graduation, according to a lot of studies (Ball, Dyer, & Garton, 2002; Kenneth, & Reed, 2009). The grade point average is typically shown to be a strong predictor of academic performance, according to these experts. In this study, the academic performance would refer to the general average rating obtained by the students in grade 12. These averages will be correlated to the different approaches implemented in the STEM strand.

Table 7 presents the academic performances of senior high school graduates in the school year 2019 – 2020. This study confirms that most students in the STEM strand are known to be academically excellent. It is shown in Table 7 that 51 (78.46%) students have outstanding academic performance ratings. While there are 12 (18.46) and 2 (3.08%) students who got very satisfactory and satisfactory performance, respectively. The general average of 90.42 revealed that most of the graduates were outstanding.

Table 7. Academic Performance of the SHS STEM Graduates who took STEM and Non-STEM-Related Programs in College

Categories	ANHS			SMNHS			Total		
	STEM Related	Non-STEM	Total	STEM Related	Non-STEM	Total	STEM Related	Non-STEM	Total
90 - 100	24	7	31	15	5	20	39	12	51
85 - 89	1	6	7	3	2	5	4	8	12
80 - 84	0	1	1	0	1	1	0	2	2
75 - 79	0	0	0	0	0	0	0	0	0
Below 75	0	0	0	0	0	0	0	0	0
Total	25	14	39	18	8	26	43	22	65

In the same table, it is gleaned that there are 12 graduates with outstanding performance who have pursued non-STEM-related programs in college. It indicates that learners from STEM don't necessarily take aligned programs in college. Some of these learners maybe were affected by their parents or pressured by their peers. Hence, the study did not specify to have in-depth reasons why these learners took non-STEM-related programs in college.

On the other hand, it is also shown that some learners who have satisfactory academic performance proceeded to non-STEM programs. These students must have difficulty in learning the concepts in science and mathematics.

4.3. Different Support Systems on STEM Strand as Perceived by SHS Graduates

In the Philippine Department of Education's K to 12 programs, teachers, learning materials, learning environment, evaluation and exits, school leadership and administration, and community-industry relevance and partnerships are all significant support systems (D.O. no. 021, s. 2019). Among these support systems, the teachers, learning resources, and learning environment are considered in this study to assess whether these affect the academic performance of the senior high school graduates in STEM strand to be particular.

Since the perpetration of the K to 12 Program, some unexpected and unanticipated problems arose like lack of facilities, instructional materials of the school, and even the shortage of teachers in the field. Department of Education cannot provide all the tracks in one school only since it is based on the needs of the locality and the availability of the classrooms, teacher qualification, and facilities. Generally, this is an encouraging scenario for STEM education in the country as more Filipino students begin to take interest in the field. However, Commission on Higher Education (CHED) issued a policy allowing the graduates of senior high school to enroll in any baccalaureate degree program regardless of the strand or track they have taken in the senior high school (CHED, 2017). The impact of these misaligned policies in terms of enrolment in STEM-related baccalaureate programs is yet to be determined in this study.

The center of the teaching-learning process in education is the learners (D.O. no. 021, s. 2019). Thus, this study assessed the K to 12 as a curriculum

through the learners who graduated from the Science, Technology, Engineering, and Mathematics (STEM) strand. In this study, the curriculum is defined as the application of the pedagogical approaches and the standards and competencies that are being provided to the learners. This enables the evaluation of the level of the implementation of the curriculum to the learners. The different support systems that the researcher considered to be affecting the academic performance of the students are curriculum, teachers, learning environment, and learning resources. The results and discussion are presented below.

Table 8 illustrates the different perceptions of the graduates regarding the curriculum as one factor considered by this study that may affect the performance of the learners in terms of academics. The curriculum guarantees that the organization's primary focus is on offering a relevant, detailed and updated, responsive, and effective basic education curriculum, which is backed up by all other strands and offices. (https://www.deped.gov.ph/about-deped/central-office/curriculum-and-instruction-functions/).

Most of the respondents have strongly agreed that the curriculum is articulated in terms of standards and competencies such as research-based, the learner is the center of the teaching and learning process, and it is also collaborative, appropriate, and relevant. The learners are the main focal point of any educational institution. Hence, the respondents have strongly agreed that they are considered as the center of the teaching and learning process. Though most of the responses fell under “agree”, it still ensures that the K to 12 curriculum has met the expectations of the senior high school learners.

The discrepancies of the schools in terms of the curriculum were on the

statements “the curriculum is constructivist”, and “inquiry-based.” The ANHS strongly agreed that the curriculum is constructivist instead of inquiry-based on the other hand SMNHS strongly agreed that it is inquiry-based than being constructivist. Hence, the schools agreed to most of the statements that describe the curriculum being implemented in the Department of Education.

Table 8. The Curriculum

Curriculum	ANHS		SMNHS		Total	
	WM	Int.	WM	Int.	M	Int.
1. The curriculum is articulated in terms of standards and competencies: a) Research-based	3.54	A	4.00	A	3.77	A
b. Decongested	2.38	D	2.54	D	2.46	D
c. Spiral Approach	2.85	NAD	2.88	NAD	2.87	NAD
2. The learner is the center of the teaching-learning process	2.23	D	2.19	D	2.21	D
3. The curriculum uses pedagogical approaches that are: a. Constructivist	4.38	SA	4.12	A	4.25	SA
b. Inquiry-based	4.08	A	4.31	SA	4.19	A
c. Reflective	4.08	A	4.04	A	4.06	A
d. Collaborative	3.90	A	3.96	A	3.93	A
e. Differentiated	4.10	A	4.19	A	4.15	A
f. Appropriate	2.21	D	2.46	D	2.33	D
g. Relevant, and	3.46	A	3.92	A	3.69	A
h. Integrative	3.38	A	3.51	A	3.45	A
Overall Average and Interpretation	**3.69**	**A**	**3.83**	**A**	**3.76**	**A**

Note: WM – Weighted Mean; Int. – Interpretation; SA – Strongly Agree; A – Agree; NAD – Neither Agree nor Disagree; D – Disagree; SD – Strongly Disagree

In the Philippines, the K–12 reform has altered the landscape of teacher quality needs. A similar supporting focus on equipping and educating teachers to deliver the K–12 curriculum is required as part of the reform process (D.O. 42, s. 2017). Teachers are the first strong support system of a curriculum. This study anticipates that every teacher should possess the qualities that are expected from them. Multiple teaching techniques, particularly open-ended and experiential methods such as scientific inquiry, engineering design, project-based learning, and

problem-based learning, are required of STEM instructors (Honey, Pearson, & Schweingruber, 2014).

Base on Table 9, the respondents have responded to strongly agree on five qualities of the teachers. The teachers are equipped to deliver the equivalent curriculum, have a passion for teaching, are always prepared for their lesson, are student-friendly, and have digital and technology literates. These qualities are being manifested in the teachers of the two schools. Hence, they agreed that teachers deliver lessons with philosophies of learner-centeredness, lifelong learning, inclusiveness, and gender sensitivity. Additionally, most teachers from both schools are teaching their specialized fields.

Table 9. The Teachers

Teachers	ANHS		SMNHS		Total	
	WM	Int.	WM	Int.	M	Int.
1. The teachers are equipped to deliver the equivalent curriculum.	4.33	SA	4.38	SA	4.36	SA
2. The teachers have a passion for teaching.	4.31	SA	4.62	SA	4.46	SA
3. The teachers are always prepared for their lessons.	4.15	A	4.42	SA	4.29	SA
3. The teachers deliver the lesson with philosophies of a. Learner-centeredness	4.10	A	4.31	SA	4.21	SA
b. lifelong learning,	4.05	A	4.27	SA	4.16	A
c. inclusiveness, and	4.08	A	4.23	SA	4.15	A
d. gender-sensitive	3.85	A	4.19	A	4.02	A
4. The teachers are student-friendly.	4.38	SA	4.19	A	4.29	SA
5. The teachers are digital and technology literate.	4.28	SA	4.42	SA	4.35	SA
6. The teachers are teaching their specialized field.	4.15	A	4.04	A	4.10	A
Overall Average and Interpretation	**4.17**	**A**	**4.31**	**SA**	**4.24**	**A**

Among these qualities, it prevailed those teachers who have passion in teaching with the highest weighted mean of 4.43 interpreted as “strongly agree.” In the same table, a weighted mean of 4.05 is the least. Though interpreted as “agree”,

it concerned in this study that few teachers may not be gender-sensitive. Hence, teachers have still shown the right qualities expected from them as the overall mean of 4.23 is interpreted as “strongly agree.”

Comparing the two schools regarding their teacher’s views, the SMNHS graduates strongly agreed that teachers are learner-centered, utilize lifelong learning, and inclusiveness than the teachers of ANHS. However, the teachers of ANHS are student-friendly compared to teachers of NHS. Based on the different observations, the graduates of SMNHS have strongly agreed to most statements about their teacher’s quality and qualifications compared to the perceptions of the graduates in ANHS to their teachers.

The learning environment has been highlighted as a key factor in fruitful STEM education (Maltese, & Tai, 2010) and much emphasis has been placed on learner and teacher views of learning environments in each of the STEM disciplines: science, technology, engineering, and mathematics (Afari, et. al., 2013). Only a few research (Vennix, Brok, & Taconis, 2017) have focused on the 'whole of STEM' learning environments.

Table 10 shows the capabilities of the school to provide services to learners in terms of the learning facilities and equipment. Both schools have provided their best to ensure that the learners have the opportunity to experience a suitable and quality environment. In the table, it is gleaned that most respondents have neither agreed nor disagree responses such as “computer laboratories are well applied and if the internet connection is accessible.” Likewise, the guidance office, registrar, sports sites, and related educational facilities were also accessible. Science laboratories and libraries have been also available to them. As an overall

result, both schools have shown a good effort to provide services such as learning facilities and equipment to the learners. The only difference between the two schools in terms of the learning environments is how conducive their rooms are.

Table 10. Learning Environment

Learning Environment	ANHS		SMNHS		Total	
	WM	Int.	WM	Int.	M	Int.
1. Rooms accommodate learners in a conducive environment.	4.10	A	4.46	SA	4.28	SA
2. Science Laboratories are available to all learners.	4.10	A	3.65	A	3.88	A
3. Computer laboratories are accessible to learners and with an internet connection.	3.33	NAD	3.12	NAD	3.22	NAD
4. Learners can freely do their PE activities.	3.72	A	4.12	A	3.92	A
5. The school library sustains the references the learners are looking for.	3.64	A	3.54	A	3.59	A
6. The learners can access school services such as guidance office, registrar, sports, and others.	4.28	SA	4.42	SA	4.35	SA
Overall Average and Interpretation	**3.86**	**A**	**3.88**	**A**	**3.87**	**A**

The supply of education to the populous of such countries is the key to long-term prosperity, peace, and stability inside and between countries. The availability and accessibility of learning resources improve the efficacy of schools since they are essential elements that can help students achieve good academic results. All organizations or institutions, according to (Maicibi, 2003), are made up of people (workers) and other non-human resources. As a result, every organization should make an effort to recruit and retain the greatest human resources. These viewpoints imply that well-trained mathematics teachers if properly deployed in secondary schools, will produce well-rounded kids who will excel academically in mathematics.

Table 11 illustrates and explains the provision of the learning materials to

the learners. The learning materials are also the resources the learners must have to access lessons and competencies. The lack of relevant teaching resources (e.g., acceptable problems matched to the curriculum and national standards) further complicates these issues. It is gleaned in the table that the learners were not properly provided with textbooks needed for some of the subjects in Grade 12.

Both statements 1 & 2 were responded as "Neither Agree nor Disagree." However, some learning materials are accessible and available online that is, some of the respondents have agreed on this statement. Hence, some learners cannot access the internet due to financial constraints. Nonetheless, the K to 12 curriculum has created learning resources that are aligned with the needs of the learners. The schools have exhibited both efforts to provide the learning resources the learners need.

Table 11. The Learning Resources

Learning Resources	ANHS		SMNHS		Total	
	WM	Int.	WM	Int.	M	Int.
1. There is a 1:1 textbook ratio.	3.31	NAD	3.54	A	3.42	A
2. All the subjects have textbooks.	2.74	NAD	3.31	NAD	3.03	NAD
3. The text-based and non-text-based learning resources are suitable to the needs of the learners.	3.67	A	4.00	A	3.83	A
4. The learning materials are aligned with the curriculum.	4.10	A	4.12	A	4.11	A
5. The learning materials are available online.	3.49	A	3.58	A	3.53	A
Overall Average and Interpretation	**3.46**	**A**	**3.71**	**A**	**3.58**	**A**

4.4. Learners Perspective on STEM Strand

This study concerns the views of the graduates on how the STEM strand had been designed for them. As learners s are the center of the learning and teaching process, therefore it is suited to inquire about their perspective on the

matter that concerns them. On the other hand, it tried to determine how sensitive and equal the approach of STEM in terms of gender. Gender equality guarantees that people of both genders have the freedom to select whatever employment, lifestyle preference, or skill set they want without fear of discrimination (https://www.humanrightscareers.com/issues/what-does-gender-equality-mean/). This study defined this term as having equal participation of male and female graduates in any STEM-related programs in college education.

Table 12 shows the different perspectives of the senior high school graduates on how they assess the STEM strand. The respondents have disagreed with the statements, “STEM strand is dominated by boys”, “STEM strand activities are in favor for boys,” and “Boys excel more than girls in this strand.” Though more girls participated in this study, it still revealed that the strand is concerned with equality for both boys and girls. It does not favor any gender instead it serves fairness in terms of activities and performance. Hence, the respondents are not sure if the STEM strand is suited for boys or girls.

However, they agreed that the strand is designed for learners who are scientifically and mathematically inclined regardless of sex. Additionally, the strand had prepared most of them to take STEM-related programs in college, the major subjects are aligned to their courses in college, are suited to their skills and they took this strand because they like mathematics and science. Anyhow, the STEM strand had provided activities and programs that are gender-sensitive and gender-equal. Above all these, the respondents have strongly agreed that “the STEM strand had provided the learners with advance learning and studies which they can use to excel and perform well in college.” Hence, the schools have two

discrepancies in terms of providing them with advanced learning and studies and directing them to proceed to related programs in college.

Table 12. The Learner's Perspective on STEM Strand

Learner's Perspective	ANHS		SMNHS		Total	
	WM	Int.	WM	Int.	M	Int.
1. STEM strand is designed for learners who are scientifically and mathematically inclined.	3.54	A	4.00	A	3.77	A
2. STEM strand is dominated by boys.	2.38	D	2.54	D	2.46	D
3. STEM strand is suited for boys than girls.	2.85	NAD	2.88	NAD	2.87	NAD
4. STEM strand conducts activities that are in favor of boys.	2.23	D	2.19	D	2.21	D
5. STEM strand provides advanced learning and studies.	4.38	SA	4.12	A	4.25	SA
6. STEM strand directed me to take a related college program.	4.08	A	4.31	SA	4.19	A
7. STEM strand provides activities that are gender-sensitive and gender-equal.	4.08	A	4.04	A	4.06	A
8. STEM strand is suitable for my skills.	3.90	A	3.96	A	3.93	A
9. The major subjects I took in the STEM strand are aligned with my college program.	4.10	A	4.19	A	4.15	A
10. Boys excel more than girls in this strand	2.21	D	2.46	D	2.33	D
11. I took STEM because I like Mathematics and Science.	3.46	A	3.92	A	3.69	A
Overall Mean and Interpretation	**3.38**	**NAD**	**3.51**	**A**	**3.45**	**A**

4.5. Correlation between the Different Support Systems on STEM Strand and the Academic Performance

The relationship between different support systems, such as the

curriculum, teachers, learning environment, and learning resources, as perceived by senior high school learner-graduates in the STEM strand and their academic performances were investigated in this study. The academic performance of the graduates was considered in this study. It is believed that academic performance may be affected by different support systems during the implementation of the Science, Technology, Engineering, and Mathematics (STEM) strand such as the curriculum, teachers, learning environment, and learning resources. The academic performance as included in this study refers to the general average of the graduates in grade 12.

Table 13 clearly shows that among the support systems towards the STEM strand only the curriculum has a significant relationship with the academic performance of the graduates. In table 8, the respondents have strongly agreed that teachers have shown and possess those characters of an ideal teacher. As a result, it bears no link to their academic success.

The teachers and learning environment affect the creation of a curriculum as they have a significant relationship with each other. This may mean that the curriculum has boldly affected the academic performance of the learners. However, teachers and the learning environment are essential in the fulfillment of a successful curriculum.

The use of learning materials as a support system has little impact on the academic achievement of STEM strand graduates. It has a major link with the teachers, on the one hand. This would mean that teachers are the important factors or actors in making the learning resources for the curriculum and the learners.

Table 13. Correlation between the Different Support Systems of STEM Strand and the Academic Performance

		Academic Performance	Curriculum	Teachers	Learning Environment	Learning Resources
Academic Performance	Pearson's r	—				
	p-value	—				
Curriculum	Pearson's r	0.260 *	—			
	p-value	0.037	—			
Teachers	Pearson's r	0.204	0.543 ***	—		
	p-value	0.103	< .001	—		
Learning Environment	Pearson's r	-0.017	0.363 **	0.592 ***	—	
	p-value	0.892	0.003	< .001	—	
Learning Resources	Pearson's r	0.021	0.167	0.460 ***	0.433 ***	—
	p-value	0.868	0.184	< .001	< .001	—

Note. * p < .05, ** p < .01, *** p < .001

Table 13. Correlation between the Different Support Systems of STEM Strand and the Academic Performance

	Academic Performance	Curriculum	Teachers	Learning Environment	Learning Resources

4.6. Correlation between the SHS Graduates Perspectives on STEM Strand and their Academic Performance

The perspective of the graduates has been anticipated to be varied aside from the fact that the respondents have come to two different schools. Countries in the West have adopted constructivist-inspired learner-centered techniques that are seen to be more motivating, updated, and relevant to learning than conventional, didactic approaches. Students' enthusiasm for STEM occupations, on the other hand, has waned or remained the same. In contrast to their Western counterparts, students in many developing nations where schooling is still fairly didactic and teacher-centered are more inclined to STEM-related occupations. In this study, the perspective of the learners toward the STEM strand is likewise correlated to their academic performance.

Table 14. Correlation between the SHS Graduates' Perspective on STEM Strand and their Academic Performance

		Academic Performance	Learner's Perspective on STEM Strand
Academic Performance	Pearson's r	—	
	p-value	—	
	95% CI Upper	—	

Table 14. Correlation between the SHS Graduates' Perspective on STEM Strand and their Academic Performance

		Academic Performance	Learner's Perspective on STEM Strand
Learner's Perspective on STEM Strand	95% CI Lower	—	
	Pearson's r	0.147	—
	p-value	0.242	—
	95% CI Upper	0.377	—
	95% CI Lower	-0.100	—

Note. * p < .05, ** p < .01, *** p < .001

Table 14 explains that the perspectives of the senior high school graduates of the STEM strand have no significant relationship with their academic performance. This would mean that the learner's academics were not affected by how STEM is being implemented. The responses of the graduates in table 9 have varied interpretations which mostly considered some gender issues. Hence, it did not impair the students to perform better in class. This resolves the concern that the learner's view or perspective on how the STEM strand is implemented has nothing to do with their achievement. Furthermore, it does not close the possibility that this may become a factor in the future research concern.

Chapter 5. Summary, Conclusions, and Recommendations

Based on the data examined in the preceding chapter, this chapter presents the findings, conclusions, and suggestions. There are a few problems that have come to light.

5.1. Summary of the Findings

The study focused on the evaluation on the impact of the different support systems such as curriculum, teachers, learning environment, and learning resources in the implementation of the Science, Technology, Engineering, and Mathematics (STEM) strand as perceived by the senior high school graduates and their academic

performance. Likewise, the learner's perspective on the STEM strand was also considered.

The study utilized a quantitative research design such as descriptive and correlational research design to investigate the significant relationships of the different variables of the study. It involved the senior high school graduates of the STEM strand of the school year 2019 – 2020. There were 65 (76%) respondents who participated in the study out of 85 (100%) from Alangalang National High School and San Miguel National High School. These are the only schools that offered the STEM strand in Area I of the Leyte Division.

The respondents were asked to respond to the survey in the google form. The survey form comprises the background information of the respondents such as sex, age, the school they took the strand, whose preference is the program, program taken in college, relatedness of the program to the strand, and preparedness of taking the strand. The respondent's general average in the first semester of the school year 2019 – 2020 was also required. Additionally, they responded on their level of perception on the different support systems of the STEM strand and their views or perspective on this strand. On the perception towards the different support systems in the implementation of the STEM strand, the respondents had varied answers according to their level of agreement as "strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree." There are the same responses from the perspective of SHS graduates to the strand. The data gathered were analyzed using simple descriptive statistical tools such as frequency, percentage, simple mean, weighted mean, and Pearson r.

The findings of this study have shown that most students have agreed that

the curriculum has met their needs. They strongly agree that teachers have shown and possessed the abilities and characters of the ideal teachers for STEM. On the other hand, most of them agreed that the schools have provided them with the needed learning environment and learning resources. Finally, most of the senior high school graduates considered in this study have outstanding academic performance.

Thus, only the curriculum has a substantial association with the academic performance of SHS graduates among the many support systems in the implementation of the STEM strand. However, the study found that instructors and the learning environment have an important role in the successful implementation of the curriculum. And the learning resources and teachers are significant with each other. Furthermore, the perspective or views of the graduates on the STEM strand has no significant relationship with their academic performance. Nonetheless, the learners have performed in the best way they can regardless of how the STEM is implemented to them.

5.2. Conclusion

This study on the perception of the senior high graduates on the different support systems in the implementation and the academic performance have shown great interest to the researcher. The researcher believes that the different support systems such as the curriculum, teachers, learning environment, and learning resources may affect the academic performance of the graduates as they move to the STEM-related programs in college.

This research concludes that the curriculum shared a very significant relationship to the academic performance of the graduates. It is to maintain that

curriculum should always seek the needs of the learners as they are the center of the teaching and learning process. The researcher does not close the possibility that these support systems have a significant relationship with each other. As the teacher and the learning environment are important factors to consider in making the curriculum while the teachers are important persons in making the learning resources.

This study also concluded that the STEM strand is gender-sensitive since it does not favor gender favoritism and discrimination. However, the academic performance of the learners is not affected by the way the STEM strand is implemented to them.

5.3. Recommendations

In all of the results and conclusions, the researcher proposed that the curriculum be strengthened further since it has a major impact on learners' and graduates' academic performance. The different support systems must be evaluated regularly to maintain their best status in serving the learners and the stakeholders. As found out that these support systems have a significant relationship with each other, the researcher recommends a further study that will look into the details of their relationships. Anyhow, it is a prime concern for the curriculum implementation to be successful to give also a priority to the needs of the teachers, the provision of an academically and friendly learning environment, and the availability and accessibility of the learning resources. The researcher believes that these support systems should always work together to attain and sustain the demands and necessities of the learners.

Appendix A

APPROVED LETTER TO CONDUCT THE STUDY

SEOUL NATIONAL UNIVERSITY
GRADUATE SCHOOL OF INTERNATIONAL STUDIES
DEVELOPMENT COOPERATION POLICY PROGRAM
Seoul South Korea

October 1, 2021

MANUEL P. ALBAÑO, Ph.D., CESO V
Schools Division Superintendent
Leyte Division Office
Candahug, Palo, Leyte

Sir:

Greetings of peace and goodwill!

The undersigned is a graduate student of Seoul National University (SNU) in Seoul South Korea. I am now working on the final requirement for the degree of Masters Degree Program in Gender and Development majoring International Cooperation. My thesis proposal entitled "PERCEPTIONS OF SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS (STEM) STRAND GRADUATES AND THEIR ACADEMIC PERFORMANCE IN LEYTE PHILIPPINES" has been already approved to continue with the data gathering phase.

In connection to this, I would like to ask permission to conduct data gathering in Alangalang National High School and San Miguel National High School of the Area I of the Leyte Division. Further, the data that will be gathered for this particular study will only be used for research purposes.

I am hoping for a positive response to this request. Thank you and more power.

Respectfully yours,

GILDO A. MORON
SNU GSIS-DCPP Student

Noted:

JEONGHUN HAN, Ph.D.
SNU-GSIS Professor/Adviser

Approved:

MANUEL P. ALBAÑO, Ph.D., CESO V
Schools Division Superintendent

APPENDIX B

SURVEY INSTRUMENT FOR EVALUATING STEM STRAND IN THE PHILIPPINES

General Instructions: Please respond to the following questions required from you. The survey assures confidentiality of your identity and responses.

I. Background Information

Name (optional): _____

Sex: ___Male ___Female ___Prefer not to Say ___Other Age: ___

School the STEM strand was taken:

___ Alangalang National High School Gen. Ave.(12) ___

___ San Miguel National High School Gen. Ave.(12) ___

Program/Degree in College:

___ Engineering Programs ___ Medical Programs

___ Business Programs ___ Humanities & Social Sciences

___ Information & Communication Technology

Preference of taking the Program:

___ Personal Choice ___ Family

___ Friends/Peer Influence ___ Others

Relatedness of the Program to STEM: ___ Yes ___ No

Preparedness of taking the Program: ___ Yes ___ No

II. Perception to the Different Support Systems on STEM Strand

Instructions: Kindly put a check to the column corresponding to your reaction regarding the implementation of the STEM strand in your school.

The responses below used the 5-Point Likert Scale.

5	-----	Strongly Agree
4	-----	Agree
3	-----	Neither Agree or Disagree
2	-----	Disagree
1	-----	Strongly Disagree

A. Curriculum

Statements	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. The curriculum is articulated in terms of standards and competencies. a. Research-based					
b. Decongested					
c. Spiral Approach					
2. The learner is the center of the teaching-learning process					
3. The curriculum uses pedagogical approaches that are: a. constructivist					
b. inquiry-based					
c. reflective					
d. collaborative					
e. differentiated					
f. appropriate					
g. relevant					
h. integrative					

B. Teachers

Statements	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. The teachers are equipped to deliver the equivalent curriculum.					
2. The teachers have a passion for teaching.					
3. The teachers are always prepared for their lessons.					
3. The teachers deliver					

the lesson with philosophies of a. learner-centeredness,					
b. lifelong learning,					
c. inclusiveness, and					
d. gender-sensitive					
4. The teachers are student-friendly.					
5. The teachers are digital and technology literate.					
6. The teachers are teaching their specialized field.					

C. Learning Environment (Facilities and Equipment)

Statements	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. Rooms accommodate learners in a conducive environment.					
2. Science Laboratories are available to all learners.					
3. Computer laboratories are accessible to learners and with an internet connection.					
4. Learners can freely do their PE activities.					
5. The school library sustains the references the learners are looking for.					
6. The learners can access school services such as guidance office, registrar, sports, and others.					

D. Learning Resources

Statements	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. There is a 1:1 textbook ratio.					

2. All the subjects have textbooks.					
3. The text-based and non-text-based learning resources are suitable to the needs of the learners.					
4. The learning materials are aligned with the curriculum.					
5. The learning materials are available online.					

III. STEM Strand: Learner's Perspective

Statements	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. STEM strand is designed for learners who are scientifically and mathematically inclined.					
2. STEM strand is dominated by boys.					
3. STEM strand is suited for boys than girls.					
4. STEM strand conducts activities that are in favor of boys.					
5. STEM strand provides advanced learning and studies.					
6. STEM strand directed me to take a related college program.					
7. STEM strand provides activities that are gender-sensitive and gender-equal.					
8. STEM strand is suitable for my skills.					
9. The major subjects I took in the STEM strand are aligned with my college program.					
10. Boys excel more than					

girls in this strand					
11. I took STEM because I like Mathematics and Science.					

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Abstract

학습자는 학습 및 교육 과정의 핵심입니다. 이는 교육 기관이 중요한 지침과 정책을 마련하도록 안내하는 중요한 우선 순위입니다. 초중고교부터 12 세까지의 교과과정의 시행은 필리핀의 교육 시스템에 근본적인 변화를 가져왔습니다. 이 연구는 고등학교, 특히 STEM 분야 또는 과학, 기술, 공학, 수학의 실행에 커리큘럼, 교사, 학습 환경 및 학습 자원과 같은 다양한 지원 시스템과 학업 성과에 미치는 영향을 평가했습니다. 65 명의 고등학교 졸업생. 정보를 수집하기 위해 구조화된 Google 설문조사 설문지를 사용했습니다. 이 연구는 지원 시스템의 중요성 수준과 STEM 분야 및 학업 성과에 대한 졸업생의 관점을 평가하기 위해 기술적 상관 접근 방식을 고려했습니다. 연구 결과, 교육과정만이

학업성취도와 유의한 관계가 있는 것으로 나타났다. 그러나 서로 다른 지원 시스템이 서로 중요한 관계가 있음을 발견했습니다. 최고의 교육 시스템을 실현하기 위해서는 서로의 지원이 필요하기 때문입니다. 또한 STEM 분야에 대한 학습자의 관점이 학업 성과에 영향을 미치지 않는다는 것을 발견했습니다. 반면 STEM 스트랜드나 커리큘럼 자체가 젠더 민감하다는 것을 증명했다. 남녀 차별 없이 공정하게 시행하고 있습니다.

키워드: STEM 과정, 커리큘럼, 교사, 학습 환경, 학습 리소스, 학업 성과
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