

A Tracer Study of Science, Technology, Engineering, and Mathematics (STEM) Strand Graduates of Divine Word College of Legazpi Senior High School Department

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Abstract: The purpose of this study was to trace the Senior High School graduates under the Science, Technology, Engineering and Mathematics (STEM) strand of Divine Word College of Legazpi and identify which of the four exits they pursued. The researchers chose to trace the entire population of the Science, Technology, Engineering and Mathematics strand graduates of Divine Word College of Legazpi, from School Years 2017-2018, 2018-2019 and 2019-2020 as the respondents of the study. The total respondents were four hundred seventy-one (471). The retrieval rate of the response was 89.17%. This study made use of the descriptive design to gather the needed data. Descriptive research aimed to describe a population, situation, or phenomenon accurately and systematically. Using an electronic survey questionnaire, the researchers were able to identify the percentage of the students who have taken the four “exits” of the Senior High School Program, in this case, most of the STEM graduates continued in Higher Education. Additionally, the researchers were able to identify the college courses that they are currently taking. Most of the STEM graduates chose higher education as one of the four exits on Senior High School. In terms of their preferred academic institution, the STEM graduates are enrolled in Bicol University, Divine Word College of Legazpi, and University of Santo Tomas – Legazpi. Three hundred forty-three (82%) out of four hundred eighteen (418) of the STEM Graduates are taking up their degree courses aligned to the strand being Bachelor’s Degree in Nursing (23.1%), Bachelor’s Degree in Civil Engineering (11.4%), Bachelor’s Degree in Architecture (9.4%), Bachelor’s Degree in Electrical Engineering (8.2%) and Bachelor’s Degree in Information Technology (5.8%) were the top five (5) choices. The remaining seventy-five (18%) of the STEM graduates enrolled on courses that were not aligned to STEM. The courses they are taking up are, Bachelor of Science in Business Administration Major in Marketing Management (8.0%), Bachelor of Physical Education (8.0%), Bachelor of Science in Economics (6.7%), Bachelor of Arts in Philosophy (6.7%), and Bachelor of Science in Entrepreneurship (5.3%) and Bachelor of Arts in Journalism (5.3%). These were some of the reasons why they did not take the course related to STEM: their current course is interesting, it is their dream course, their courses serve as a pre-requisite subject to their dream course and influences from parents and peer.

Keywords: Tracer Study, STEM Graduates

I. INTRODUCTION

The 2011 State of the state Address (SONA) of former late President Aquino, as quoted

“... ngayon pa lang, nagtatagpo na ang kaisipan ng DOLE, CHED, TESDA at DepEd upang tugunan ang isyu ng job mismatch, susuriin ang mga curriculum para maituon sa mga industriyang naghahanap ng empleyado, at gagabayan ang mga estudyante sa pagpili ng mga kursong hitik sa bakanteng trabaho.”

In addressing the emerging and sophisticated nature and challenges of the 21st century, teaching stands out as the foremost key to deal with reforms. Through its essential functions of instruction, research, extension and production, pedagogy makes up a significant and strategic part in development. Moreover, Executive Order No. 83, series of 2012 establishes the Philippine Qualifications Framework, which mandates agency responsibilities like DepEd, CHED, TESDA, PRC and DOLE to review learning standards in basic education, technical skills development and better education and within the alignment of licensure examination.

In the Official Gazette, an official journal of the Republic of the Philippines, the Senior High School (SHS) covers the last two years of the K to 12 program and includes Grades 11 and 12. In SHS, students will go through a core curriculum and subjects under a track of their choice. Students will undergo assessments to determine their strengths and interests. These will include an aptitude test, a career assessment exam, and an occupational interest inventory for high schools. Career advocacy activities will also be conducted to help guide students in choosing their specialization or track. This ensures that by the time one graduates from Senior High School, he will have the standard knowledge, skills, and competencies needed to go to college. Senior High School covers eight learning areas as part of its core curriculum, and adds specific tracks (similar to college courses) based on four disciplines: Academic (which includes Business, Science & Engineering, Humanities & Social Science, and a General Academic strand), Technical-Vocational-Livelihood (with highly specialized subjects with

TESDA qualifications), Sports, and Arts & Design. Senior High School “completes” basic education by making sure that the high school graduate is equipped for work, entrepreneurship, or higher education. This is a step up from the 10-year cycle where high school graduates still needed further education (and expenses) to be ready for the world.

In the article written in Minnesota State, students’ who graduated in the STEM strand will acquire “STEM skills” needed in a workplace. Most employers want workers who can reason and solve problems using some math, science, or technology knowledge. Key STEM skills include:

- Analytical skills to research a topic, develop a project plan and timeline, and draw conclusions from research results.
- Science skills to break down a complex scientific system into smaller parts, recognize cause and effect relationships, and defend opinions using facts.
- Mathematic skills for calculations and measurements.
- Attention to detail to follow a standard blueprint, record data accurately, or write instructions.
- Technical skills to troubleshoot the source of a problem, repair a machine or debug an operating system, and computer capabilities to stay current on appropriate software and equipment.

In addition, many workers in STEM fields use "soft" skills at work as much as they use math and science. These soft skills include:

- Communication and cooperation skills to listen to customer needs or interact with project partners.
- Creative abilities to solve problems and develop new ideas.
- Leadership skills to lead projects or help customers.
- Organization skills to keep track of lots of different information.

STEM was meant to epitomize a major connection that occurred among science, technology, engineering, and arithmetic (Bolds, 2017; Patton, 2013). STEM strand focuses on advanced concepts and topics compared to other strands. During this strand, students are expected to become a pilot, an architect, an astrophysicist, a biologist, a chemist, an engineer, a dentist, a nutritionist, a nurse, a doctor, and plenty more, even the marine engineers could take this track. According to Lagarto *et. al* (2018), one amongst the explanations provided by proponents of the K to 12 law is that SHS graduates can work or engage in entrepreneurial activities if they value more highly to do. They view K to 12 programs as a way of helping the scholars to land on better job opportunities after graduation or when they can’t enroll themselves in college right away. The curriculum also aims to train the scholars to become entrepreneurs by adding classes that tackle about managing businesses. The entrepreneurship component offers basic business management, which encourages the scholars to come up with business ideas and make a profit in line with their passion. Quite half (50%) of high school graduates directed within the STEM field are not prepared for his or her

tough college coursework (American College Testing [ACT] Inc., 2015).

Schomburg, H. (2016) defines tracer study as a survey (in written or oral form) of graduates from education institutions, which takes place sometime after graduation or the end of the training. Furthermore, Regional Memorandum No. 90, series of 2018 of Department of Education Region V stated that conducting a tracer study in SHS graduates is highly recommended. The conduct of the tracer study is in line with the goal of the K to 12 Basic Education Program that is to improve the overall quality of education in Filipino schools.

The tracer study goals to evaluate the exits taken by the STEM Graduates. The results will enhance the Senior High School department services especially in terms of the curriculum development. The teachers will be able to come up with tailored discussions and activities that would best equip the students to be ready in a fast-changing society.

Statement of the Problem

This study traced the Science, Technology, Engineering and Mathematics strand graduates of DWCL-SHS S.Y. 2017-2018, 2018-2019, 2019-2020. This study sought to answer the following research questions:

1. What is the percentage value of the graduates of Science, Technology, Engineering and Mathematics strand pursue:
 - a. Entrepreneurship,
 - b. Employment,
 - c. Mid-Level Skills, or
 - d. Higher Education?
2. What are the current schools and courses being taken up by the STEM graduates?
3. What are the reasons of STEM graduates’ students for not taking up courses aligned to STEM strand?

Scope and Limitations of the Study

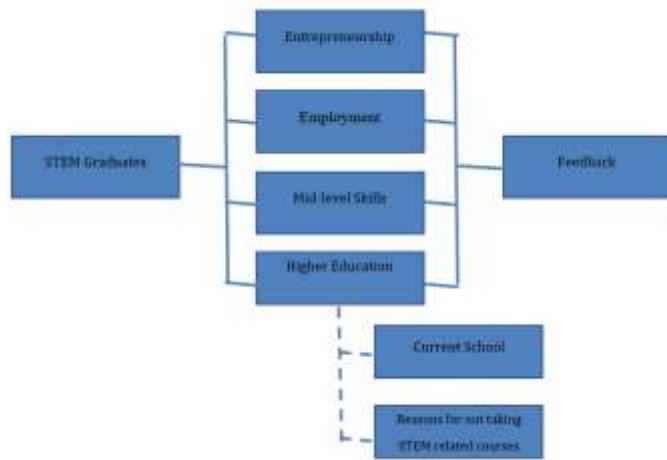
This study gave importance on the Senior High School context and focused on the Science, Technology, Engineering and Mathematics (STEM) strand of School Years 2017-2018, 2018-2019, and 2019-2020 to know what exit or choice they made after graduating in Senior High School. The researchers focused only on the STEM graduates as they were the main subjects of this research. The students who pursued higher education were identified whether their chosen strand had aligned them to their chosen collegiate course as well as the students who pursued the other exits (Mid-level skills, Entrepreneurship, Employment) of the Senior High School.

Graduates of other strands (i.e. ABM, GAS & TVL) were excluded from this study along with the STEM students who did not graduate from Divine Word College of Legazpi – SHS Department in the School Years 2017-2018, 2018-2019, and 2019-2020.

Conceptual Framework

The main objective of this study was to trace the Senior High School graduates under the Science, Technology, Engineering and Mathematics (STEM) strand of Divine Word College of Legazpi and identify which of the four exits did they pursued. Figure 1 shows the process of obtaining this objective by first tracing/locating the STEM graduates' whereabouts in terms of entrepreneurship, higher education, mid-level skills, or employment.

Figure 1. Conceptual Framework



II. METHOD

Research Design

This study made use of the descriptive design to gather the needed data. Descriptive research aimed to describe a population, situation, or phenomenon accurately and systematically. It can

answer *what, where, when* and *how* questions, but not *why* questions (McCombes, 2022). The researchers used a complete enumeration where all members of the population are measured (DATA COLLECTION STRATEGY, n.d.).

Sources of Data

This study used two (2) types of data sources: primary and secondary. The primary source of data came from the survey answers of the Science, Technology, Engineering and Mathematics strand graduates of Divine Word College of Legazpi S.Y. 2017-2018, 2018-2019 and 2019-2020. The secondary source of data were the records of the registrar's office.

Population and Sample of the Study

The researchers chose to trace the entire population of the Science, Technology, Engineering and Mathematics strand graduates of Divine Word College of Legazpi, from School Years 2017-2018, 2018-2019 and 2019-2020 as the respondents of the study.

Table 1. Population of the Study

Section	S.Y. 2017-2018	S.Y. 2018-2019	S.Y. 2019-2020	TOTAL
Buerschen	35	44	38	117
Estioko	35	45	39	119
Floresca	35	43	35	113
Mueller	37	47	38	122
	142	179	150	471

The total respondents were four hundred seventy-one (471). The retrieval rate of the response is 89.17%.

Table 2. Retrieval Rate of the Response

Section	S.Y. 2017-2018		S.Y. 2018-2019		S.Y. 2019-2020	
Buerschen	35	100	37	84.09	37	97.37
Estioko	31	88.57	35	82.22	38	97.44
Floresca	25	71.43	43	100	31	88.57
Mueller	34	91.89	38	80.85	35	92.10

Research Instrument

This research utilized a survey questionnaire. This instrument helped to identify the percentage of students who have taken either of the four "exits" of the Senior High School Program. Moreover, this instrument was able to classify the College courses that the STEM graduates are taking up presently.

The survey questionnaire used in this tracer study was based on the given open-source questionnaire by the DepEd Region X. The researchers made some modifications to complement the respondents of the study.

Data-gathering Process

The researchers conducted a survey to all the Science, Technology, Engineering and Mathematics strand graduates of Divine Word College of Legazpi Senior High School from School Years 2017-2018, 2018-2019 and 2019-2020. The researchers created an online survey form using Google Form as their platform. A link was forwarded to the graduates of Science, Technology, Engineering and Mathematics strand of 2018, 2019 and 2020. The respondents were asked to indicate some personal information but were also assured of confidentiality. The survey lasted for two months (January – February 2021) during the process.

III. RESULTS AND DISCUSSION

This section shows the results and discussion of the data collected from the 421 respondents who graduated from the DWCL SHS of 2018, 2019 and 2020 presented using tables and figures to represent and to discuss the following: The percentage of the STEM graduate who took up Entrepreneurship, Higher Education, Mid-Level Skills, or Employment; the school they were currently enrolled at, the courses being taken up by the STEM graduates; and the reasons of STEM graduates' students for not taking up courses aligned to STEM strand.

Four Exits of the Senior High School Graduates

Figure 2. The Percentage of the STEM. graduates who took up Entrepreneurship, Higher Education, Mid-Level Skills, or Employment

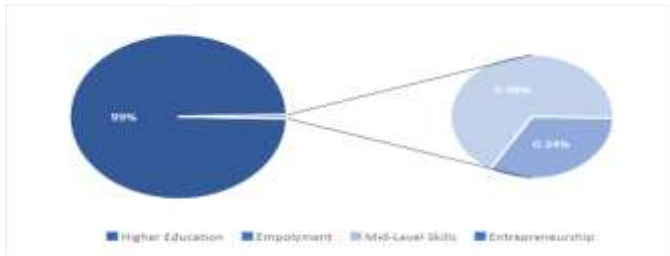


Figure 2 shows that four hundred eighteen (418) STEM Graduates of Divine Word College of Legazpi Senior High School department chose Higher Education to get a degree. Two (2) of the Graduates pushed through with Entrepreneurship; One student supported their family business, which is a Café and the other, started an Online Business. One (1) student enrolled in Automotive Servicing NC II for Mid-level Skills.

No STEM graduate applied for a job after Senior High School. Based on an article written by Janvic Mateo (2018), a journalist of Philippine Star, A survey was conducted by JobStreet as part of its 2018 Fresh Graduate Report showed only 24% of employers using website are ready to hire the first batch of the graduates of the K-12 program. Furthermore, it was also revealed that 35% of employers on JobStreet are not ready to hire K-12 Graduates, while 41% are still undecided. The article explains that there are still few employers that will hire Senior High graduates. In this case, there is a lack of availability of jobs that accepts non-college graduate.

Additionally, on the article published Attorney Dodo Dulay (2019) on the website The Manila Times, he said that it is a conventional wisdom among the Filipino families that their children should acquire a college degree to land a good and stable job. Meaning, the Filipino parents think that if their children go to college, the success rate of their employment will increase.

Current Schools and Courses Taken up by the STEM Graduates

Figure 3. Current Schools that the STEM Graduates are enrolled

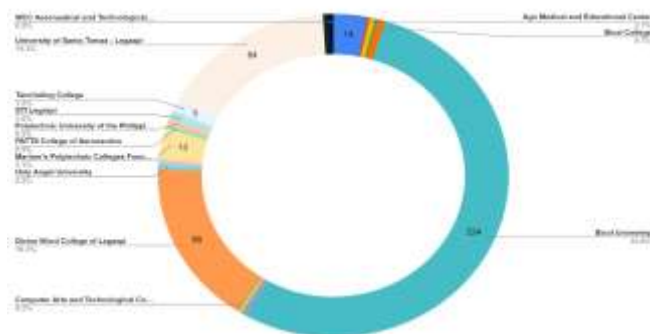


Figure 3 shows the top five (5) university/college that the STEM graduates chose to get their degree are Bicol University (53.6%), Divine Word College of Legazpi (16.3%), and University of Santo Tomas – Legazpi (15.3%), Ago Medical and Educational Center and Mariner’s Polytechnic Colleges Foundation (3.1%), and Tanchuling College (1.2%).

This entails that when it comes to the instructional delivery, the Senior High School department provides the student with aligned and tailored subjects that can be on par with the curriculum of Bicol University and other esteemed schools.

Table 3. Percentage of STEM Graduates with relevant degree in College

Batch	Aligned		Not Aligned	
	Frequency	Percentage	Frequency	Percentage
S.Y. 2017-2018	114	84.44	21	15.56
S.Y. 2018-2019	113	79.02	30	20.98
S.Y. 2019-2020	116	82.86	24	17.14
Total	343	82.06	75	17.94

Table 3 shows that 82.06% of the STEM Graduates are taking up their degree courses relevant to the strand. Batch 2018 graduates has a higher percentage of graduates that pursue relevant course in college. There were 17.94% of the STEM Graduates are taking up their degree courses not relevant to the strand.

Figure 4. Percentage of the Aligned Courses being taken by the STEM Graduates

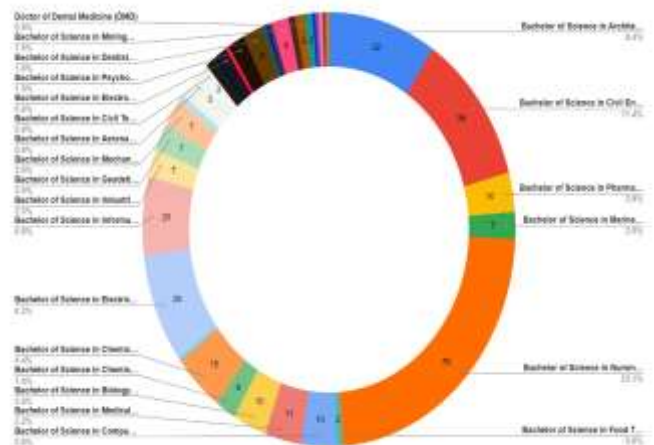


Figure 4 shows that 23.1% of the STEM graduates are taking up Bachelor’s Degree in Nursing, 11.4% are taking up Bachelor’s Degree in Civil Engineering, 9.4% in Bachelor’s Degree in Architecture, 8.2% are those who are taking up Bachelor’s Degree in Electrical Engineering and 5.8% are interested to take Bachelor’s Degree in Information Technology.

Reasons of STEM graduates for not taking up courses aligned to the strand

Figure 5. Percentage of the other courses being taken by the STEM Graduates

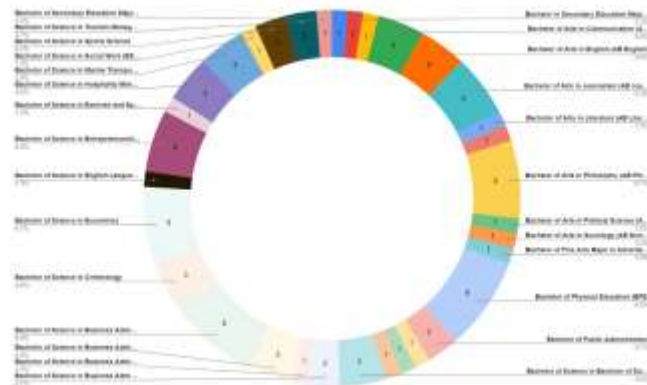


Figure 5 shows the courses that were not aligned to STEM related courses. 8.0% of the students taking up Bachelor of Science in Business Administration Major in Marketing Management and Bachelor of Physical Education, 6.7% of the students were taking up Bachelor of Science in Economics and Bachelor of Arts in Philosophy, and 5.3% are students taking up Bachelor of Science in Entrepreneurship and Bachelor of Arts in Journalism.

The reasons of the respondents for not taking the courses related to STEM were: 65 graduates found that their current course was interesting, 13 graduates enrolled in their dream course, 11 students took their course because it is a pre-requisite course to their dream course, 9 students selected their course because of parent’s influence, 3 students chose their course because of peer influence and other reason includes: late realization, it’s an easy course, the availability of the course as an athlete, and still undecided.

IV. CONCLUSIONS AND RECOMMENDATIONS

The purpose of the current study was to trace the Senior High School graduates under the Science, Technology, Engineering and Mathematics (STEM) strand of Divine Word College of Legazpi and identify which of the four exits they pursued. Based on the data collected, the researchers have formulated the following conclusions.

Based on the results of the study, the researchers concludes that most of the STEM graduates chose higher education as one of the four exits on Senior High School. The top three universities/colleges that the graduates are currently enrolled are Bicol University Divine Word College of Legazpi, and University of Santo Tomas – Legazpi. Three hundred forty-three (343) out of four hundred eighteen (418) of the STEM Graduates are taking up their degree courses aligned to the strand being Bachelor’s Degree in Nursing, Bachelor’s Degree in Civil Engineering, Bachelor’s Degree in Architecture, Bachelor’s Degree in Electrical Engineering and Bachelor’s Degree in Information Technology are the top five (5) choices whereas seventy-five (75) of the STEM graduates

enrolled on courses that are not aligned to STEM. The top courses are Bachelor of Science in Business Administration Major in Marketing Management, Bachelor of Physical Education, Bachelor of Science in Economics, Bachelor of Arts in Philosophy, and Bachelor of Science in Entrepreneurship and Bachelor of Arts in Journalism. These are some of the reasons why they did not take the course related to STEM: their current course is interesting, it is their dream course, their courses serve as a pre-requisite subject to their dream course and influences from parents and peer.

The researchers asked the respondents for some recommendations. These were the suggestions for the improvement of the Senior High School curriculum. First, the students were looking for opportunities to have laboratory activities or experiments for them to apply the theories and lessons being taught to them. Second, they were suggesting having a specialization on STEM strand: Specialization that focuses on different fields of science and medicine and specialization that focuses on algorithm, engineering, and technology. Third, the activities/performance tasks given by the teachers should be authentic and contextualized based on the needs of the students. Fourth, to include Robotic subject as part of the curriculum of the STEM. Lastly, the graduates are asking to have a work immersion aligned to the program for them to grasp real experience in their chosen field.

Based on the recommendations from the respondents and the conclusions, the researchers recommend the following: 1. The curriculum guide of the STEM should inculcate laboratory activities especially for science and health subjects; 2. The activities that are being done must be intensified in terms of the specialization that they are offering to the student; 3. Extensive career programs/seminars discussing STEM related courses to increase the alignment of courses being taken by the STEM Graduates.

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