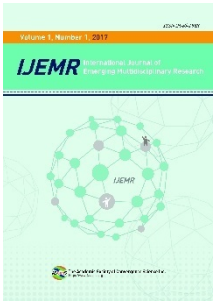

International Journal of
Emerging Multidisciplinary Research

ISSN : 2546-1583
Volume 4, Number 4, December 2020
https://doi.org/10.22662/IJEMR.2020.4.4.001

Analysis of Engineering Curricula for Implementation on Academic Year 2018-2019: The Case of Bulacan State University, Philippines

Cecilia A. Geronimo[1], Audie L. Geronimo[2]

[1]Professor, College of Engineering, Bulacan State University, 3000, Philippines
[2]Professor, College of Engineering, Bulacan State University, 3000, Philippines

Abstract

Background/Objectives: This study intends to explore the challenges encountered by freshmen engineering students in terms of intellectual, financial, emotional, environmental, physical, and social. Methods/Statistical analysis: The mixed method of descriptive research was employed in this study. For purpose of data collection, a locally constructed and validated twenty-two item questionnaires were distributed and interviews were conducted. The randomly selected 300 students were the respondents of the study enrolled in the second semester of the academic year 2018-2019. Findings: The general weighted average of the first semester ranges from 1.50 to 2.50 which mean average intelligent quotient, and majority enrolled the regular course loads of the second semester of the academic year 2018-2019. Also, from the twenty-two-item survey questionnaire administered in the six dimensions of challenges encountered, the Intellectual, Environmental, and Physical got an average weighted mean of 4.01, 3.87, and 3.7, respectively with a verbal interpretation of agree. Furthermore, the next dimensions of challenges encountered were Emotional, Financial, and Social which had an average weighted mean of 3.46, 3.30, and 2.98, respectively and all had a verbal interpretation of slightly agree. Moreover, from the eight engineering programs, four programs such as Electrical, Mechanical, Industrial, and Manufacturing agreed to those six dimensions of challenges encountered while the other four programs like Civil, Computer, Electronics, and Mechatronics slightly agreed. Interviews were also conducted with randomly selected freshmen engineering students from the eight engineering programs. Improvements/Applications: The cited challenges may be remedied through this 21st Century learning intervention programs.

Keyword

Outcomes-based education, engineering program specifications, engineering curriculum components

Corresponding author : Audie L. Geronimo
audie_8888@yahoo.com

• Manuscript received September 25, 2020.
• Revised October 17, 2020 ; Accepted October 30 , 2020.
• Date of publication December 31, 2020.

I. INTRODUCTION

Most universities in the Philippines admitted the first batch of graduates of the K to 12 program this academic year 2018-2019. The universities offering engineering programs are now implementing the four-year engineering curricula. Although those students with the track of Science, Technology, Engineering, and Mathematics (STEM) are the preferred students to enter Engineering programs, the Commission on Higher Education (CHED) still allowed graduates of other tracks, the condition was to enroll in a bridge program where those preparatory subjects like Mathematics and Sciences should be taken and passed either before the start of the academic year or simultaneous with the regular academic loads prescribed in the engineering curricula. Even before the implementation of the K to 12 program, everyone knew how difficult are the engineering programs and the fact that major adjustments should be overcome by the freshmen engineering students. Different challenges may be encountered in terms of intellectual, financial, emotional, environmental, physical, and social.

The intellectual growth level of freshmen students is based on innocent positive assurance. They believe what were have been told by their parents, teachers, and influential friends. Those freshmen students have heard much good news about the board examinations results of Bulacan State University that is why they got interested to be admitted to the University. They are not much aware that academic success and adjustment, specifically in the first year are very dependent on how well they are prepared when they enter the University. Also, these freshmen had no idea of their class schedules and student support services the University can provide them.

Most of the freshmen students in the University College of Engineering are residing in Bulacan and nearby provinces, they opted to choose to study in the University because of the free school tuition and miscellaneous fees, all undergraduate students of Bulacan State University availed this due to the implementation of Republic Act 10931, proximity of the University from their residences, good academic and social reputation, graduates get good jobs, and the expenses to finish the program may be affordable.

In every Engineering program, students can join their co-curricular and extra-curricular organizations where they can participate and have opportunities to be involved in clubs, cultural activities, social events, and sports. For engineering students, actual involvement in extra-curricular activities are minimal but more interested in co-curricular activities.

The Bulacan State University has five campuses, the main campus is located in the City of Malolos, the other four satellite campuses are also located in another city and towns of Bulacan with more or less thirty-eight thousand students where twenty-five thousand students are enrolled in the main campus. There are thirteen colleges in the main campus and the flagship program is

Engineering. The biggest population of students are in the College of Engineering, it is the College that brings good image in the University because of the high percentage of passing in the licensure examinations, inclusion in the top-performing schools in the country, and the many board placers produced in the licensure examinations. Although it is capital intensive to offer Engineering programs, as a developing country, the national government has to invest in our young citizens. The learning physical facilities, laboratory equipment, and other facilities are provided to the engineering students.

The researchers deemed it important to assess the challenges being encountered by the freshmen engineering students to plan and integrate intervention programs for their next higher-level activities.

Statement of the Problem

The general problem of the study is “How may the challenges encountered by the freshmen engineering students of Bulacan State University be explored and consequently used as the basis for 21st Century learning intervention program?”

Specifically, the study sought answers to the following questions:

1. How may the demographic profile of the freshmen engineering students of Bulacan State University be described in terms of:
   1.1 age,
   1.2 gender,
   1.3 socioeconomic status,
   1.4 general weighted average in the first semester, and
   1.5 total number of units enrolled this second semester of the academic year 2018-2019?

2. What is the level of agreement on challenges encountered by the freshmen engineering students based on the following:
   2.1 intellectual,
   2.2 financial,
   2.3 emotional,
   2.4 environmental,
   2.5 physical, and
   2.6 social?

3. What 21st Century Learning intervention program may be proposed to overcome the freshmen

engineering students' challenges?

A. Conceptual Framework

The conceptual paradigm of the study was shown in Figure 1. The first frame consists of the inputs considered in the conduct of the study such as the related literature and studies on the challenges and dimensions of life and the challenges encountered by the freshmen engineering students, to wit; intellectual, financial, emotional, environmental, physical, and social. The second frame pertains to the process involved in the conduct of the study like the development, construction, and validation of questionnaire and structured interview questions, profile and perception of the freshmen engineering students about their challenges encountered, and analysis of the challenges. The third frame contains the explored challenges encountered by freshmen engineering students and the proposed 21st Century Learning Intervention Program.

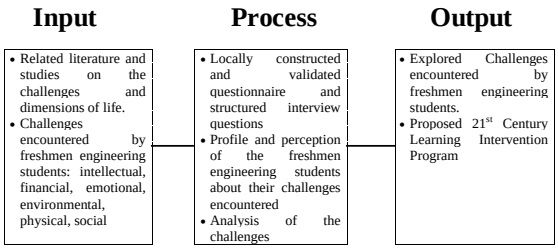

Fig.1. The conceptual paradigm of the study

II. METHODS AND MATERIALS

A. Methods and Techniques of the study

This study utilized the descriptive research mixed method. The freshmen engineering students were described in terms of their profile described as age, gender, socio-economic status, general weighted average in the first semester, the total number of units enrolled in the second semester of the academic year 2018-2019. Also, the challenges encountered by the freshmen engineering students were described in terms of intellectual, financial, emotional, environmental, physical, and social. These composed the quantitative aspect of the study the qualitative part also described the experiences and challenges faced by the freshmen engineering students.

B. Respondents of the Study

There were 300 freshmen engineering students randomly selected from the nine hundred eighty population who served as respondents of the study. There are twenty-three sections from the eight engineering programs offered by the Bulacan State University. The four engineering programs with licensure examinations such as civil, electrical, electronics, and mechanical have three sections each and forty-five students per section, while the three engineering programs without licensure examinations such as computer, industrial, and mechatronics have forty students each program and three sections, and manufacturing engineering with two sections and forty students per section.

C. Research Instrument

The researchers constructed and validated an instrument of the study which are composed of Part I which described the profile of the respondents in terms of age, gender, socio-economic status, the general weighted average of the first semester, and the total number of units enrolled in the second semester of the academic year 2018-2019. Also, Part II described the challenges encountered by the freshmen engineering students in terms of intellectual, financial, emotional, environmental, physical, and social. There were twenty-two items of the challenges, four items for intellectual, emotional, financial, and social while three items for environmental and physical. The five-point Liberty scale used the level of agreement such as 5- strongly agree, 4- agree, 3- slightly agree, 2- strongly disagree, 1- disagree on the challenges encountered by the freshmen engineering students. Furthermore, a questionnaire for the interview was constructed focused on the experiences and challenges faced by the freshmen engineering students.

Scale	Range	Verbal Interpretation
5	4.51-5.00	Strongly Agree
4	3.51-4.49	Agree
3	2.51-3.50	Slightly Agree
2	1.51-2.50	Disagree
1	1.00-1.50	Strongly Disagree

D. Data Gathering Procedure

The researchers submitted a letter of request to the Dean for permission to allow the distribution of the questionnaires and conduct of the interview among the 300 freshmen engineering students. Upon the Dean's approval, the faculty assistant and staff assisted the researchers in the distribution and retrieval of the questionnaires, the Dean provided the print schedules and list of the freshmen engineering students for identification of their classrooms and laboratories being used. The faculty members were approached and the approved letter was shown and requested a few minutes after their class to answer the questionnaires. The interview was conducted by the

researchers during the free time of selected freshmen engineering students.

E. Data Processing and Statistical Tools Used

The data gathered were tallied in the prepared tabulations. Afterward, computations were made to determine the frequency counts and percentage for every profile in terms of age, gender, socio-economic status, general weighted average in the first semester, and the total number of units enrolled in the second semester of the academic year 2018-2019. The average weighted mean for the level of agreement on the challenges faced by the respondents in terms of intellectual, financial, emotional, environmental, physical, and social were computed.

III. RESULTS AND DISCUSSION

The majority of the respondent -freshmen engineering students are nineteen years of age while more than half of them were males. In the socio-economic status, most of the respondents belong to middle-income families, also, their intellectual capacities were considered as above average, and almost all of the respondents enrolled their regular academic loads except for some who became irregular due to failing grades.

The major challenges encountered by the respondent-freshmen civil engineering students were intellectual, environmental, and physical. Their responses both on the questionnaire and interview conducted were complementing as indicated in the results: preparedness in all the subjects enrolled is wanting and they are not used to the combination of day and night time class schedule, also, find it difficult to transfer from one building to another.

The two major challenges encountered by the respondent-freshmen computer engineering students were intellectual and physical. These responses were manifested from the ratings in the table and focus group discussion, to wit; they complained about the too many activities per subject, not yet adjusted with the afternoon and evening class schedule, with a continuous class schedule of six hours without break, and forget to recharge the needs of their bodies like foods and water.

Table 1
Summary of the Descriptive Measures of the Challenges Encountered by the Freshmen Engineering Students

Challenges	CE	CpE	EE	ECE	IE	MFE	ME	MEE	AWM	VI
Emotional	3.33	3.42	3.38	3.34	3.57	3.6	3.69	3.32	3.46	SA
Environmental	3.79	3.49	3.98	4.11	3.96	3.9	4.04	3.68	3.87	A
Financial	3.18	3.13	3.39	3.22	3.16	3.60	3.58	3.16	3.30	SA
Intellectual	3.80	4.01	3.84	3.86	4.13	4.23	4.27	3.92	4.01	A
Physical	3.64	3.99	3.67	3.62	3.60	3.93	3.71	3.44	3.70	A
Social	2.9	2.86	2.98	2.81	2.89	3.15	3.34	2.88	2.98	SA

The intellectual, physical, and environmental challenges encountered by the respondent- freshmen electrical engineering students were major factors in the survival of their University life. Focus and more time for studies on their academic subjects, collaboration with the members of the class for all the activities, and adjustment in the availability of spaces/facilities/utilities should be coped up.

From the responses on the questionnaire and interview, the freshmen electronics engineering students revealed that they must overcome their intellectual, environmental, and physical challenges. They need tutors/mentors to lighten their burden in understanding and passing their subjects; spaces/facilities, foods, and water which will revitalize their bodies and minds should always be available.

The major challenges encountered by the respondent-freshmen industrial engineering students were intellectual, emotional, environmental, and physical. They mentioned during the interview what they had experienced and experiencing should be overcome, fear, depression, and having nightmares about what they have done during the daytime may affect too much their brains. This period of adoption in their University life is very critical, thus, intervention programs should be provided to them.

Five out of six challenges encountered by respondent-freshmen manufacturing engineering students were all major challenges and these were intellectual, emotional, financial, environmental, and physical. True enough even in the interview, they spoke out their experiences and requesting assistance for them to finish their four-year engineering program.

The intellectual, financial, emotional, environmental, and physical were the major challenges encountered by respondent-freshmen mechanical engineering students. Their responses in the questionnaire were validated in the interview. They were amenable that they took for granted their studies during junior and senior high school, but believed that there are sacrifices they have to surpass to attain happiness which is completing their engineering program, and adaptation to the University culture is very necessary.

The major challenges encountered by the respondent- freshmen mechatronics engineering students were intellectual and environmental. All of the respondents involved in the interview unanimously agreed that the engineering program is difficult to finish, they have to strive harder and more time should be allotted to studies. They are requesting for extra services which can be provided by the College of Engineering faculty members and senior engineering students as well.

The following 21st Century Learning intervention programs were proposed to help our freshmen engineering students cope up or overcome the

challenges encountered by them in terms of intellectual, financial, emotional, environmental, physical, and social.

The faculty-student or student peer mentoring program through face to face or online delivery mode; every program has its student organization and faculty members who may be involved in this mentoring program, initially, the student officers and faculty members will gather data or information, problems with solutions, and other concepts per subject, and identify who has the expertise to handle specific topics, and prepare the schedule based on the availability of mentor and mentee;

Conduct the problem -solving skills training through a blended mode of delivery; encode and upload all the problems and solutions, prepare the group chat account for all the students and faculty members, schedule the problem-solving skills training every week in the audiovisual room to accommodate many students, invite some experts who handle mathematics, and sciences, allied and professional subjects;

Use of social media to upload instructional and competency enhancement materials; to allow readiness and preparedness among students, instructional and enhancement materials may be uploaded, a web developer may be commissioned to do these.

Creation of information and communication technology learning environment which shows the mastery experiences of student peers; presentation through audio-video the successful experiences of senior students and graduates who will encourage the freshmen students, success stories of graduates who overcome the different challenges encountered during their University life;

Development of stress-relief and recreation student-organized activities for their active involvement; the office of student affairs and services prepared monthly program entitled " GEARTUES " which will imbibe the core values of the university stated as Service to God and community; Order and peace; Assurance of quality and accountability; and Respect and responsibility (SOAR), there is a need to organize recreational activities which will relieve the challenges encountered particularly in their studies, like sports activities, fun games, and social activities.

Utilization of a mobile application that can diagnose the mental capacities of individuals (SYM) research-based mobile application conducted by our Information Technology senior students. In this particular mobile application, students who do not want to reveal their mental status can use and diagnose for themselves, and when necessary consult professionals who may also assist.

IV. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings, the following conclusions were drawn:

1. The major challenge encountered by all the freshmen engineering students was intellectual.
2. The civil, computer, electrical, electronics, industrial, manufacturing, and mechanical freshmen engineering students considered both intellectual and physical as major challenges.
3. The minor challenge encountered by all the freshmen engineering students was social.
4. The civil, electrical, electronics, industrial, manufacturing, mechanical, and mechatronics freshmen engineering students agreed that intellectual and environmental as major challenges.

The following recommendations were put forward based on the findings and conclusions:

1. Involvement of the College of Engineering faculty members and officers of the different engineering student organizations in the proposed 21st Century Learning intervention programs in terms of sharing their expertise in the development of software or programs for the online delivery of mentoring, problem-solving skills training, and instructional and enhancement materials. This is to enhance the intellectual capacities of the engineering students.
2. The College of Engineering administration and faculty members may solicit the cooperation of the alumni to share their successes to inspire the freshmen engineering students on their specific program. The audio-video may show the trials, tribulations, and triumphs of their University and professional life.
3. The advisers of student organizations may coordinate with the Dean and Directors of student affairs and services for the schedule of the monthly program entitled "GEARTUES ", request speakers and facilitators for the stress-relief and recreation student-organized activities.
4. The University shall continuously implement the physical plant development for additional buildings to be used by the engineering students.

REFERENCES

[1] Baldwin, D. R., Towler, K., Oliver, M. D., & Datta, S. (2017). An examination of college student wellness: A research and liberal arts perspective. Health Psychology Open, 4(2), 2055102917719563.

[2] Fischer, K. E., Kittleson, M., Ogletree, R., Welshimer, K., Woehlke, P., & Benshoff, J. (2000). The relationship of parental alcoholism and family dysfunction to stress among college students. Journal of American College Health, 48(4), 151-156.

[3] Morse, G. (2006). Sparking creativity at Ferrari.

[4] Gustafson, C. M. (2002). Employee turnover: a study of private clubs in the USA. International Journal of Contemporary Hospitality Management.
[5] Hale, C. J., Hannum, J. W., & Espelage, D. L. (2005). Social support and physical health: The importance of belonging. Journal of American College Health, 53(6), 276-284.
[6] Hattie, J. A., Myers, J. E., & Sweeney, T. J. (2004). A factor structure of wellness: Theory, assessment, analysis, and practice. Journal of Counseling & Development, 82(3), 354-364.
[7] Hughes, R. B. (2006). Achieving effective health promotion for women with disabilities. Family & community health, 29(1), 44S-51S.
[8] Johnson, R. E., & Johnson, P. G. (2003). Are H&P programs for you?. Strategic Finance, 85(6), 39.
[9] Laguador, J. M. (2013). Academic problems and negative attitude of engineering students towards engineering program. International Journal of Managment, IT and Engineering, 3(7), 495-505.
[10] Laguador, J. M. (2013). Engineering Students' Level of Study Habits and Factors Affecting Them. International Journal in IT and Engineering, 1(3), 1-13.
[11] Leland, R., Richardson, J., Lee, T. Y., & Dantzler, J. (2005). Teaching Freshman Engineering Students to Solve Hard Problems. age, 10, 2.
[12] National Sleep Foundation. (2007). How much sleep do we really need?".
[13] Daud, N. A. M., Yusuf, H. M., Ahmad, N., & Sa'ad, F. (2017). A Descriptive Study of Wellness among Undergraduate Students in a Public University in Malaysia. International Journal of Academic Research in Business and Social Sciences, 7(10), 533-542.
[14] Roslender, R., Stevenson, J., & Kahn, H. (2006). Employee wellness as intellectual capital: an accounting perspective. Journal of Human Resource Costing & Accounting.
[15] Stoewen, D. L. (2017). Dimensions of wellness: Change your habits, change your life. The Canadian veterinary journal, 58(8), 861.
[16] Ureda, J., & Yates, S. (2005). A systems view of health promotion. Journal of health and human services administration, 5-38.
[17] Zwetsloot, G., & Pot, F. (2004). The business value of health management. Journal of Business Ethics, 55(2), 115-124.
[18] Peterson, T. (2018). What is Emotional Wellness?. Healthy Place. https://www.healthyplace.com/self-help/self-help-information/what-emotional-wellness
[19] Crisp, R. (2001). Well-being.
[20] https://www.academia.edu/4832673/Academic_Problems_and_Negative_Attitude_of_Engineering_Students_Towards_Engineering_Program
[21]]http://research.lpubatangas.edu.ph/wp-content/uploads/2014/04/IJITE-ENGINEERING-STUDENTS%E2%80%99-LEVEL-OF-STUDY-HABITS.pdf
[22] https://shcs.ucdavis.edu/wellness/financial
[23] https://www.grcc.edu/humanresources/wellness/sevendimensionsofwellness
[24]https://shcs.ucdavis.edu/wellness