

# Assessing graduates' attributes and job performance for program curriculum enhancement

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## ABSTRACT

Graduate tracer studies are essential for higher education institutions (HEIs) as valuable information can be uncovered and derived that is useful for curriculum development, revision, or enhancement. This descriptive research study, using a questionnaire as the main data-gathering tool, determined the job attributes and job performance of the Bachelor of Science (BS) Mathematics graduates from 2013 to 2017 from a state university in the Philippines. Results revealed that the graduates were currently employed in various positions in both private and government institutions, with either permanent or contractual status. The graduates identified skills in mathematics, communication, computer, human relations, entrepreneurship, problem-solving, and critical thinking as vital in performing their duties and obligations in the workplace. Overall, the graduates' job performance is outstanding. Based on the findings, suggestions to improve the BS Mathematics curriculum of the concerned HEIs were discussed to make it more relevant, responsive, adaptive, and inclusive.

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## 1. INTRODUCTION

Higher education institutions (HEIs) are critical in assisting individuals' development in performing various roles and functions [1]-[5]. Producing quality and multi-faceted graduates who can potentially contribute to nation-building is the ultimate goal of any institution of higher learning [6]. Considering that the achievement of student learning outcomes is a product of innovations in teaching [7], [8], teachers must provide students with relevant learning experiences [9]-[13] to prepare them to function effectively in their future employment [14], [15].

Meanwhile, one of the degree programs in the Philippines is the Bachelor of Science (BS) in Mathematics. In terms of career or employment, mathematics is extremely important, especially in jobs or professions that require numerical literacy and mathematical proficiency. It is said that mathematical ability and a higher level of mathematical literacy can lead to a more productive future [16]. A bachelor's degree in mathematics qualifies graduates for various positions in the business industry, government, and private corporations [17], [18]. While graduates seek a job that matches their degree, it is also vital for HEIs to survey their graduates to be informed of their job attributes and job performance by conducting graduate tracer study (GTS) [19].

Research on graduate tracer studies reveals various uses for the results. Primarily, they can provide

meaningful evidence about the reputation of the institution and the quality and relevance of instruction and programs it provides to its students [20]-[22]. Conducting GTS will help HEIs recognize the aspect or aspects of the curricular program that need improvement to provide sufficient preparation for graduates for employment and better develop sound work ethics and values for those who are still in the program [23], [24]. Moreover, GTS enables HEI to identify critical issues that must be addressed, such as a more in-depth approach to issues or trends of particular interest to graduates' prospective careers or employment. These also provide information for upgrading the curriculum and course contents, which could help graduates meet changing market needs [22]. Studies on graduate employment and labor market outcomes provide HEIs with indicators that contribute to effective course planning, curriculum design, and student guidance systems. Also, equally important as determining graduates' job attributes is assessing their job performance through their respective employers to generate concrete and relevant information that can be used for curriculum planning, development, and enhancement [25]. The findings of said studies open up a plethora of possibilities for HEIs to incorporate necessary enhancements into their current curriculum [26].

Most GTS conducted focused on the employment rate and profile of the graduates. Notably, the graduates' job performance in those GTS was not included as a research variable that can potentially provide information about the skills and competencies demanded by the employers to ascertain employees' efficiency and effectiveness in the workplace and if the graduates satisfactorily demonstrate these competencies. Operating on this knowledge gap, this study was conducted to determine the job attributes of the BS Mathematics graduates of a state university in the Philippines. The specific objectives of the study are: i) to determine the graduates' current job/position, type of agency where employed, the status of employment, and number of years in the current job; ii) to identify the relevant job-related competencies the graduates learned from the curricular program; and iii) to assess the graduates' job performance level along various indicators. From the results, some suggestions for enhancing the BS Mathematics curriculum of the HEI were discussed.

## **2. METHOD**

### **2.1. Research design**

This descriptive study used the cross-sectional survey research design which utilized questionnaires for gathering the needed data. The primary purpose of a cross-sectional survey was to capture a snapshot of the BS Mathematics graduates' characteristics, behaviors, attitudes and their employers perceptions on their work places. A questionnaire was sent to the graduates and to the supervisors of those who were employed to gather data pertaining on the level of performance of the graduates in their respective workplaces.

### **2.2. Sources of data**

The respondents of the study were the BS Mathematics graduates from 2013 to 2017 from a state university in the Philippines who were currently employed, together with their respective employers who provided information regarding their job performance. There were 93 currently employed from the 160 graduates. Thus, 93 graduates and 93 employers were given questionnaires. However, only 80 accomplished questionnaires were retrieved from both the graduates and the employers. In the discussion of the results, only the data gathered from these 80 accomplished and retrieved questionnaires were analyzed and discussed. For ethical considerations, all respondents indicated their voluntary agreement to participate.

### **2.3. Instrumentation and data collection**

Two structured survey questionnaires, one for the graduates and the other for their respective employers, were utilized. These underwent validity and reliability tests. The research instruments were distributed using multiple platforms – face-to-face administration, through online forms, or sent via email.

### **2.4. Analysis of data**

The graduates' job attributes were analyzed using frequency and percentage. As regards to job performance, a 5-point scoring system was utilized. The scores provided by the employers for each indicator were summarized using medians. A score of 5 means "outstanding – the performance is consistently superior. No supervision is required", 4 means "exceed expectations – the performance is beyond the requirements of the job. Minimum supervision is needed", 3 means "meet expectations – the performance is regularly competent and meets standards without constant supervision", 2 means "below expectation – the performance fails to meet the job requirements frequently and needs constant supervision", and 1 means "unsatisfactory – the performance is consistently unacceptable."

### 3. RESULTS AND DISCUSSION

#### 3.1. Graduate job attributes

##### 3.1.1. Current job or position

It is essential for HEIs to be informed of the current jobs or positions of their graduates. This offers potential baseline information on the type and kind of innovation needed to be integrated into the curriculum. Thus, the study included data on the current job or position of the graduates as part of their job attributes. Figure 1 shows that BS Mathematics graduates hold various jobs or positions grouped into four major categories. Of these positions, jobs related to customer service pegged the highest percentage of 39%. This group includes cashiers, sales ladies or salesmen, service crew, sales assistants, and customer service personnel. Moreover, 36% of the graduates work as office personnel such as accounting staff, bookkeepers, loan specialists, office branch staff, sales analysts, and production officers.

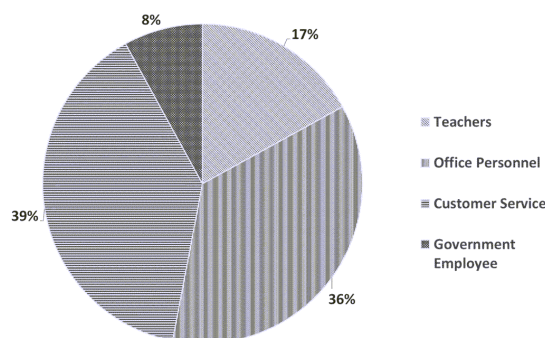


Figure 1. Current job/position of the graduates

Interestingly, 17% of the graduates were employed as teachers in various basic education institutions and HEIs in the country. Others are teaching mathematics in other Asian countries. As observed, the BS Mathematics program produces multi-faceted graduates as highlighted by [2], [18]. Given the data on the current positions of the graduates, school administrators are encouraged to ensure the alignment between the curriculum and the career opportunities for their future graduates.

##### 3.1.2. Type of agency where currently employed

The study also classified the type of agency where the graduates are currently employed. As a result, 75% of the graduates hold various positions in private companies such as educational institutions, production companies, financial institutions, and customer service business establishments. Belonging to this category are graduates who were hired as customer service personnel. Some are private school teachers or office workers. Evidently, BS Mathematics graduates are qualified for a range of jobs in business, government, and corporations [17]. Moreover, the remaining 25% of the graduates occupy positions in government offices, including government-funded educational institutions.

From the informal interview conducted, the graduates who were employed in government institutions are those who possess career service eligibility. These are graduates who passed the Philippines Civil Service Commission Career Service Examination or those who graduates with latin honors. In the case of those employed as teachers, they are those who were awarded college scholarships by the Department of Science and Technology. As scholars, they are mandated to render return services, which includes being teachers in various government-funded educational institutions.

Overall, the findings suggest that there are more employment opportunities for fresh college graduates in private institutions, considering that they have not yet gained relevant work experience. In the context of the Philippines labor market, gaining relevant work experience and training is an advantage to securing a job in the government. It can also be inferred from the findings that there is a need to design and implement a student support program that can help prepare students for the Civil Service Career Examination while they are still enrolled in the program [22]. Doing this can increase their chance of passing the said government examination and thus increase their probability of securing an employment position after graduation.

### 3.1.3. Employment status

Majority (54%) of the graduates are employed with contractual status. Such finding can be explained and cross-checked with their year of graduation. From the profiling made by the researchers, most of the employed are graduates of the BS Mathematics program in 2015, 2016, and 2017. In the context of the Philippines, an employee can be given a permanent status if the required number of years has been satisfied, the required qualifications or eligibility were met, and the performance evaluation is at least satisfactory [26]. Further results shows that 46% of the graduates have already gained permanent status. These include those working as teachers in the government. Accordingly, these graduates have satisfied the necessary requirements to become permanent employees in terms of residency and performance evaluation.

### 3.1.4. Monthly income

In Table 1, 62% of the graduates earn at least Php 10,000.00 monthly. Of these figures, 31% earns Php 10,000.00-Php 14,999.00 a month while 16% receives a monthly salary of at least Php 20,000.00. These graduates occupy positions as teachers in government or private educational institutions. There are also office personnel who earn at least Php 10,000.00 monthly, particularly those who are working in an established institutions. Moreover, 38% earn a monthly salary of Php 9,999.00 and below. According to the 2020 occupational wages survey (OWS) of the Philippine Statistics Authority [26], the median monthly basic salary of full-time Filipino workers across all sectors and industries is Php 13,646.00. From this, it can be estimated that half of the graduates are considered below-average income earners.

Table 1. Monthly income of the graduates

Monthly income	Frequency	Percentage
Below Php 5,000.00	7	9
Php 5,000.00–Php 9,999.00	23	29
Php 10,000.00–Php 14,999.00	25	31
Php 15,000.00–Php 19,999.00	12	15
Php 20,000.00 and above	13	16
Total	80	100

### 3.2. Competencies learned in college that are relevant to their current job

Table 2 reveals that mathematical skills, communication skills, and computer skills are the top three competencies that the graduates affirm as relevant in the accomplishment of their tasks in their current job. These skills were identified by 91%, 85%, and 71% of the graduates, respectively. These supports the findings of [13], [14] that students should be provided with the necessary skills for future employment and preparing them to function effectively in their workplace.

Table 2. Competencies learned from the curricular program

Competencies	Frequency	Percentage
Mathematical skills	73	91
Communication skills	68	85
Computer skills	57	71
Human relations skills	55	69
Entrepreneurship skills	51	64
Problem-solving skills	50	63
Critical-thinking skills	47	59

Being engaged in delivering mathematics instruction as teachers, computing financial obligations, and dealing with financial transactions, the graduates also confirmed that knowledge of arithmetic operations and numerical manipulations is essential to perform their roles effectively. Also, since the graduates deal with different people all the time, they pointed out that expressing and conveying their ideas orally or in written form using appropriate language contributes to their favorable performance at work. Because communication does not only happen face to face, it is also important to use technologies effectively in delivering their ideas. According to the graduates, there are instances where they need to deliver their lessons to the students through the use of electronic devices. Another vital skill was human relations skills. It is important that they know how to deal with people and handle complex situations at work. As mentioned, work ethics and values should also be one of the skills that graduates must possess [23], [24].

In summary, more than half of the respondents agree that the skills enumerated above were strengthened while they were still enrolled in the BS Mathematics program. This suggests that the program supports the development of these various skills of the students which enables them to cope with various challenges in their workplace after graduation effectively [14], [15], [27]. Furthermore, the graduates were able to obtain 21<sup>st</sup>-century skills and competencies through pre-service training provided by the BS Mathematics program. Thus, it is important that current practices of the program that support the development of these skills be sustained or enhanced. Professors, moreover, are also encouraged to provide more meaningful learning experiences to the students that intend to develop other 21<sup>st</sup>-century skills that will make them more competitive and effective in their respective workplaces [28]-[32].

### 3.3. Job performance of the Bachelor of Science Mathematic graduates

One vital component of this study is the evaluation of the graduates' job performance. Thus, a job performance questionnaire was administered to the immediate supervisors of the employed graduates. Table 3 reflects that the graduates demonstrated outstanding job performance in 14 out of 18 indicators, according to the evaluation of their immediate supervisors. These 14 indicators recorded a median score of 5.00 points. Accordingly, more than 50% of the employed graduates demonstrate "outstanding performance" in these 14 indicators such as knowledge of work, communication, interpersonal relationship or teamwork, responsibility and commitment, independent action, quality of work, leadership, client responsiveness, productivity, dependability, adherence to policies, responsiveness, attendance, and appearance.

Table 3. Performance evaluation of the graduates by their employers

Indicators	Median score	Description
Knowledge of work	5	Outstanding
Communication	5	Outstanding
Interpersonal relationship/teamwork	5	Outstanding
Responsibility and commitment	5	Outstanding
Decision-making/problem-solving	4	Exceeds expectations
Expense management	4	Exceeds expectations
Human resource management	4	Exceeds expectations
Independent action	5	Outstanding
Quality of work	5	Outstanding
Leadership	5	Outstanding
Management of change/improvement	4	Exceeds expectations
Client responsiveness	5	Outstanding
Productivity/independence/reliability	5	Outstanding
Dependability	5	Outstanding
Adherence to policies	5	Outstanding
Employee's responsiveness	5	Outstanding
Attendance	5	Outstanding
Personal appearance	5	Outstanding
Overall job performance	5	Outstanding

This suggests that the graduates are responsive to the needs and requirements of their job, complete their tasks based on set schedules, and produce quality outputs with minimum supervision. The employers commend the graduates' quality and neatness of outputs while completely adhering to established processes and procedures, their willingness to accept changes positively, flexibility in accommodating additional tasks, and effectiveness in producing the required outputs in a given period of time with little to no supervision needed. Moreover, the findings show that the graduates consistently value neatness and pleasing personality as important components of their job performance. Likewise, the immediate supervisors agree that the graduates can easily establish favorable work relationships and demonstrate respect among their fellow employees. Also, the graduates consistently demonstrate punctuality and obedience to rules related to uniforms, schedules, and attendance. These characteristics may define the success of the employed graduates in their workplace as revealed in the study of Abas and Imam [25].

Further result shows that the graduates exceeded the expectations of their employers or immediate supervisors in terms of decision-making or problem-solving, human resource management, expense management, and management of change and improvement which were expected to be developed during their years in college as BS Mathematics [16], with median scores of 4. According to the graduates, decision-making was among the lowest since it is a major function of their immediate supervisors or employers. Their participation in decision-making is only limited to giving suggestions, ideas, and opinions.

As a whole, the job performance of the graduates is outstanding. Such information retrieved from the tracer study gives insights for the institution to incorporate necessary and quality enhancements into the curriculum. This shows the strong commitment of the faculty members in the BS Mathematics program in developing the totality of every student and equipping them with appropriate 21<sup>st</sup>-century competencies that assisted them in delivering outstanding performance in their workplaces. Further, it emphasizes that the program provided the BS Mathematics graduates with necessary intellectual, moral, and social development support through the delivery of quality services in instruction, research, and community involvement. The provision for the conduct of extension programs and student-led activities has helped them hone their leadership qualities and perform their roles, duties, and assignments in their workplaces independently or in groups with competence, consistency, and commitment. Their engagement in research activities enhanced their independence, reliance, dependability, and problem-solving. Also, the strict implementation of the university's guidelines, rules, and policies allowed them to recognize the value of obedience and adherence to policies. The varied learning experiences provided to them allowed them to develop their flexibility and adaptability.

### **3.3.1. Employers' comments/suggestions to improve the graduates' job performance**

The comments and suggestions of the immediate supervisors of the graduates were considered in this study to enhance or sustain their job performance rating. The immediate supervisors noted that the graduates need certain improvements in communication skills in order to improve their confidence in dealing with various situations professionally. They also noted the need for upgrading technical and digital literacy, particularly in using MS Excel to process mathematical data and various programs as required in the work assignment. Further training and seminars on mathematics software are also suggested. Likewise, the employers suggested training students further to demonstrate emotional maturity during challenging times where criticisms and comments must be taken constructively and positively. These suggestions, comments, and recommendations necessitated the institution to revisit the BS Mathematics curriculum and integrate relevant innovations based on the findings of the study.

### **3.4. Suggested enhancements to the bachelor of science mathematics curriculum**

Based on the findings, the study suggested a list of possible enhancements to the BS Mathematics curriculum. First, considering that the graduates have high employment opportunities in the teaching profession, it is suggested to offer additional elective courses related to the teaching profession in addition to the existing two courses in principles of teaching. Second, the institution is encouraged to purchase additional mathematics software and integrate the use of these software into any applicable mathematics courses. Third, to increase the chance of graduates in securing government positions, it is suggested that the institution will strengthen its existing student support and development services by designing a program that provides review sessions for students who have taken at least 72 units of the degree program to prepare them sufficiently for the Career Service Examination. As a consequence of having been hired in government institutions, the graduates will be able to earn a higher monthly basic salary. Fourth, to consistently ascertain that students are provided with quality instruction, teachers teaching the program are encouraged to continuously update and upgrade their teaching competence through training and advanced studies to keep abreast with the innovations in education and the demands of industries locally and globally. Knowledge and skills acquired from training and advanced studies can improve their teaching practices, leading them to incorporate innovations into their instructional methodologies. Fifth, the institution is recommended to ascertain students' maximum participation in various academic, extra, and co-curricular activities to enhance their skills, knowledge, attitudes, and values. Finally, the institution is encouraged to strengthen its internship program for the students to provide exposure and experiences to actual situations in their target employment or career path. The institution can further establish partnerships with private and government institutions to provide students with rich and diverse experiences in the workplace through on-the-job training.

#### 4. CONCLUSION

The current study aimed to determine the job attributes and job performance of BS Mathematics graduates. From the results, the graduates are employed in various positions in government and private institutions, with either contractual or permanent employment status. The employers' evaluation indicated that the job performance level of the graduates was outstanding. Several suggestions were forwarded by the employers that serve as bases for the academic institution to revisit and integrate necessary revisions to the existing curriculum of the BS Mathematics program. Based on the findings, the study identified a list of suggestions to enhance the program curriculum. The suggestions included the integration of additional elective courses, ascertaining the relevance of the program and teachers' teaching practices through training and advanced studies, enhancing the technological aspect of the curriculum, preparing students for the Career Service Examination, and maximizing students' participation in various academic and non-academic activities. The study also offered a noble contribution to conducting a graduate tracer study, specifically the integration of the graduates' job performance as among the major variables in addition to their job attributes. When combined effectively, findings on the graduates' job attributes and performance can inform curriculum developers and innovators about the enhancement to be integrated into the existing curriculum to make it more relevant, responsive, adaptive, and inclusive.

The study results highlighted graduate tracer studies as a tool for measuring graduates' employability and as a means for gathering feedback for curriculum enhancement. Most importantly, the inclusion of graduates' job performance as a research variable in this study can provide researchers with an additional indicator to explore in conducting a graduate tracer study. Lastly, the study presented how the job attributes and performance of the graduates were considered in crafting policy recommendations for the enhancement of the BS Mathematics program curriculum.

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