

Modeling and Assessment of Job Performance of BS Mathematics Graduates Based on Program Outcomes

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Abstract – *The success of a curricular offering by a university can be assessed through the job performance of its graduates equipped with relevant competencies. Determining the insight of employers on the work competency based on program outcomes and satisfaction on the job performance of the BS Mathematics graduates is the main objective of the study. The study employed a descriptive survey of research method using the employers as the key informant. Findings suggest that several graduate outcomes can be utilized to estimate the satisfaction rating of the employers to the BS Mathematics graduates' job performance. The findings propose the requirement for continuous and regular assessment on the feedback to incorporate the viewpoints on the curricular offering. Further, the academic institution should continue monitoring the graduate's work performance by identifying the differences between developments of learning in the classroom and the requirement of their actual work in the industry. Additionally, the study recommends the improvement of program outcomes incorporating employer feedback which is relevant in the enhancement of the job performance of the graduates.*

Keywords - *Employer's Feedback, Performance Model, Program Outcome, Regression Analysis*

INTRODUCTION

Every institution is entrusted with the obligation of putting its graduates becoming globally competent with employable skills. Job performance assessment is valuable in evaluating the relevance and effectiveness of a curricular program. Plantilla [1] reiterated the importance of acquired competencies in the valuation of the effectiveness of a curricular offering. Støren [2] contended that the characteristics of a program of study have a great impact on the relevance of the curriculum in the world of work. Baruch, Bell, and Gray [3] described that the most protuberant impact of obtained aggregates of skills and competency which are both critical in the career success of the graduates. The curricular offering should be equipped with a variety of technical and generic skills to prepare the graduate for employment. New competencies are developed since job activities are constantly changing and getting more complicated [4]. Curricular subjects and program goals must be established and designed to prepare students to achieve their educational goals.

Minimum standards have to be met by academic institutions to address industry needs [5]. With the usage of results-based instruction in the country [6], Higher Education Institutions (HEIs) are directed with certain concepts and principles that will measure the performance of the learners. The University has

persistently and continuously updated its methodologies and avenues to realize its vision and mission. The curriculum of the BS Mathematics program along with program outcomes provides a clear way on what a student needs to attain from the degree program. Feedbacks from employers serve an important role in reviewing the curriculum in order to achieve the expected program outcomes.

Program outcomes must include important competencies that should be achieved by all graduates. Constant assessment of the program outcomes is a major criterion needed in the overall evaluation of the curriculum which is vital to coping with the complexity of job activities. Assessment decides the attainment of the expected for both student and a program; and results in actions to further improve the curriculum and program. Premalatha [7] argued that the constant evaluation of the course outcome assumes a noteworthy role in improving the quality of a curricular offering in an Outcomes-based education. The role of an industry supervisor should be clearly defined to attain optimal feedback [8]. The program requires to have at least a couple of assessments where it can validate the complete cycle of the continuous improvement plan that shows that the program can effectively be improving [9].

Program outcome (PO) is commonly assessed by mapping the Course outcome [10]. While this method

provides an initial insight success of the student, it is still worth note to consider the employers' perspective. Employer's feedback is a direct assessment of the quality of graduates. It also delivers relevant information on acquired proficiencies and qualities they considered that are significant and relevant in the working environment [11]. Feedback performance derives from the necessity to include the viewpoints of the employers and the academic institution upon the graduate's performance recognizing the gap in which the learning process both occurs in the workplace and the classroom [12]. Measuring such differences is crucial to both parties, identifying the critical competencies required for a graduate useful in the work setting. Moreover, the employer's feedback will serve as a reference in improving the institution's curricular content that would help graduates attain the necessary and relevant proficiency required by the industry.

The university is mandated to produce globally competent and value-laden graduates, develop a future professional workforce equipped with the high level of acquired knowledge and aptitudes required by the industry. Recognizing the relevant competencies of graduates of the BS Mathematics provides how the curricular offering delivered its outcomes effectively using the feedback performance of the graduates. The goal of the study is to determine the competency level in line with the student and program outcomes of the BS Mathematics graduates as evaluated by their employers; and, to identify factors contributory to the level of satisfaction on specific work performance in light of the assessment of the employers on the BS math program outcomes. The result will be used to enhance the program offering to enable BS Mathematics graduates to be more equipped with relevant competency and to have better employment opportunities. Moreover, the result of this study will provide an insight that will realign the desired program outcome more responsive to the needs of the industries and the community.

MATERIALS AND METHODS

The study utilized a descriptive survey of research method to decide the level of competency of the BS Mathematics graduates from 2006 to 2016. Descriptive research was applied to define the characteristics and behavior of the employers of the BS Mathematics graduates.

To check the validity of the instrument, the researcher sought the help of experts in the field of research. The questionnaire was tried by employers to evaluate its reliability. These employers were not included as participants in the study. The questionnaire used for employers' feedback was taken from the BS

Mathematics program identified student outcomes. To trace the employment of graduates, they were either contacted using their contact numbers or email from the database of the University. Moreover, social media was also employed as means for tracing the graduates. The researchers gathered basic data on their company name, their address, the number of employees, industry sector, and legal organization. The survey covered eight (8) program outcomes which include: (i) Subject Specialist, (ii) Investigative & Critical Thinkers, (iii) Adaptive, (iv) Independent, (v) Well-Rounded, (vi) Ethically, (vii) Aware, Socially Aware, and (viii) Confident & Effective Communicators. Moreover, work performance was measured in three aspects: (i) Theoretical and Practical Knowledge in Delivering Tasks and Responsibilities, (ii) Trainability of Employed Graduates on the Skills Needed for the Job, and (iii) Carrying of Positive Work Attitude such as Teamwork, Confidence, Self-Motivation. Each aspect was measured by three attributes with a total of nine attributes. Their assessments were indicated by a score on a five-point scale as follows: 1.00 – 1.80 – Poor; 1.81 – 2.60 – Fair 2.61 – 3.40 – Good; 3.41 – 4.20 – Very Good; 4.21 – 5.00 – Outstanding.

There were 43 samples who participated in the study. For companies/organizations employing more than one graduate, they were requested to randomly select one graduate for assessment. Assessment of the graduates was done by their immediate supervisors, and they were invited to complete and return the instrument through email or using a self-addressed envelope. Field visits, as well as follow-up calls, were also done to samples who failed to send back the instrument.

The following statistical tools were employed in the study such as frequency and percentage distribution, composite mean, Pearson r, and regression analysis.

RESULTS AND DISCUSSION

Competency on Program Outcomes of BS Math Graduates

Table 1 presents the level of competency of BS Mathematics graduates in light of the eight program outcomes. Employers have a major role to fill in particularly in the assessment of the competency of the graduates based on the program outcomes which served as the channel to ensure that information generated by graduates is being practiced. A closer look at the table shows that all program outcomes have weighted means ranging from 4.05 – 4.49, verbally rated from Very good to Outstanding.

Topping the lists of outcomes are well-rounded and ethically aware with the same mean rating of 4.49 (outstanding). The employers acknowledged the

competence of the BS Math graduates along with the commitment to sustainability and high ethical standards in social and professional practices. Lai et. al [13] concluded that the training program has successfully fulfilled the University’s expectation in turning out well-rounded students. Learning experience provides a platform to graduates in the acquisition of necessary learning abilities identified with the job.

BS Mathematics graduate was rated with an outstanding performance along adaptability and flexibility to deal with changing work environment (4.40), production of outputs on time while working with little supervision (4.42), and ability to recognize the essential for work, and a capacity to take part in long-lasting learning with a mean rating of 4.21. BS Math graduates were given workloads by their respective employers wherein they were expected to be adaptive, independent, and socially aware relative to the organization’s goals. Employers were looking for employees that are not only competent in terms of technical skills but also with personal qualities such as flexibility and keenness to acquire new knowledge [1].

Table 1. Level of Competency on Program Outcomes of BS Math Graduates

Program Outcomes	WM	DE
1. Broad work mastery and practical knowledge. (Subject Specialist)	4.14	VG
2. Conducts research related for continuous improvement of the organization. (Investigative Independent & Critical Thinkers)	4.05	VG
3. Adaptable and flexible to cope with changing work environment. (Adaptive)	4.40	O
4. Produces outputs on time while working with little supervision. (Independent)	4.42	O
5. Listens mindfully to guidelines and follows request as taught and enthusiastic in learning skills the latest advancement related to the job. (Well-rounded)	4.49	O
6. Value and promote truth, accuracy, honesty, accountability and ethical standards. (Ethically Aware)	4.49	O
7. Perceive the need for, and a capacity to take part in deep-rooted learning. (Socially aware)	4.21	O
8. Possess effective reading, listening, oral and composed relational abilities. (Confident & effective communicators)	4.19	VG

WM-Weighted Mean, DE-Descriptive Equivalent, 1.00 – 1.80 – Poor(P); 1.81 – 2.60 – Fair(F) 2.61 – 3.40- Good(G); 3.41 – 4.20 – Very Good(VG); 4.21 – 5.00 – Outstanding(O)

The graduates’ performance along with broad work mastery and practical knowledge (4.14), conduct research related for constant improvement of the organization (4.05), and possess effective reading,

listening, oral and written communication skills (4.19) were all descriptively rated to be very good. Surprisingly, investigative independent and critical thinkers are identified to be the least mean attribute score among BS Math graduates. This result is congruent to the findings of Encio et. al. [12] wherein research skills were rated low in terms of the job performance of the graduates.

Satisfaction on Work Performance of BS Math Graduates

Table 2 presents the satisfaction level on the performance of the BS Math graduates in the workplace as rated by their respective employers. There are several methods to survey the satisfaction on individual work performance, and each has its strong point and flaws. There is no extreme standard or even one best way. Work performance was measured using three central points which include: Theoretical and practical knowledge, trainability, and positive work attitude. The result is congruent to the study of Jackson [14] which suggests assessment of graduates must have a theoretical process of identifying the relevant competencies which have a significant effect on the performance in the workplace.

Generally, employers were satisfied with the work performance of the BS Mathematics graduates with a mean rating ranging from 4.19 – 4.49. It can be noted that eight items were assessed with a very satisfactory level and one item rates as highly satisfied.

In terms of trainability, employers were very much satisfied in the capacity to learn new abilities and information at work with a mean rating of 4.49. This result complies with the expected graduate outcome of the BS Math program to be an adaptive and well-rounded professional in their field. These attributes also correspond to the employer’s satisfaction with the adaption to the existing technology relevant to the endeavor and enthusiasm in learning skills on the latest advancement to the job with a mean rating of 4.33 and 4.44, respectively.

On-the-job training is incorporated in the curriculum of the BS Math to guarantee that learning experience is achieved in the actual work setting. This assures students to be adaptable and flexible in dealing with changing work environments capable of meeting the industry needs.

Employers are in search of applicants that are equipped with relevant behavioral abilities such as being initiative, morally righteous, self-motivated/ self-starter, and with self-confidence. The employers emphasize the capacity to exhibit uprightness of character or action, acting responsibly with the welfares

of the greater community in mind, and the ability to learn from mistakes.

Table 2. Satisfaction on the Performance in the Workplace of BS Math Graduates

Factors	WM	DE
A. Theoretical and Practical Knowledge		
1. Possess specialized skills and information required for the job	4.33	VMS
2. Observes protocols in reporting using standard	4.19	HS
3. Ability to solve work-related problems	4.21	VMS
Composite Mean(DE)	4.24(VMS)	
B. Trainability		
1. Capacity to learn new aptitudes and information at work	4.49	VMS
2. Adapts to the existing technology relevant to the endeavor	4.33	VMS
3. Enthusiastic in learning skills on the latest advancement in line with the job	4.44	VMS
Composite Mean(DE)	4.42(VMS)	
C. Positive Work Attitude		
1. Works well in a group to achieve a goal	4.47	VMS
2. Ability to handle stress and pressure on the job	4.23	VMS
3. Accepts other jobs other than specified on the job description	4.37	VMS
Composite Mean(DE)	4.36(VMS)	

WM-Weighted Mean, DE-Descriptive Equivalent, 1.00 – 1.80 – Least Satisfied (LtS); 1.81 – 2.60 – Less Satisfied (LeS) 2.61 – 3.40- Moderately Satisfied (MS); 3.41 – 4.20 – Highly Satisfied (HS); 4.21 – 5.00 – Very Much Satisfied (VMS)

Immediate supervisors of the BS Mathematics graduates also rated a notable approval on the positive work with the mean rating of 4.36, verbally rated as very much satisfied. Specifically, employers regarded BS Math graduates on how they work in a group to achieve a goal, their ability to handle stress and pressure on the job, and how they accept other jobs other than specified on the job description. These values are being instilled by the PSU faculty to their students which significantly contribute to the future employment of the graduates. This likewise proposes that the academic institution prepared and developed its graduates with the essential skills needed in the job. Moreover, the university has embedded additional requirements within degree courses that are generally recognized and relevant sets of attributes.

Theoretical and practical knowledge of BS Math graduates were also rated as very much satisfied with a mean rating of 4.24. Knowledge, skills, and competencies are involved in interactive service work. Contrary, the findings of Thompson et al. [15] revealed that the knowledge has been taken to be of a smaller value in a work environment. The academic institution is then expected to provide to its students' wide

opportunities that will harness the relevant competencies, likewise providing a platform of opportunities for self-assessment for every learning experience. Such opportunities are critical and necessary for any graduate to be effective in the actual work setting.

Model of Satisfaction on Work Performance

Table 3 presents the model in each work performance based on the assessment of the employers on the BS math program outcomes. Using the stepwise regression method, each program outcome was fitted selecting the significant predictor to every work performance. The final model of each performance indicator can be gleaned in Table 3.

Results show that the work performance in terms of Theoretical and Practical Knowledge in Delivering Tasks and Responsibilities is a function of three program outcomes: Independent, Socially Aware, and Investigative Independent & Critical Thinkers. These competencies were found to be significantly related to the performance in the delivery of tasks and responsibilities within the work setting of the BS Math graduates. It is well noted that these competencies are practically important in predicting the knowledge in delivering tasks and responsibilities. For some types of jobs, social skills add to the prediction of job performance [16]. The result also supports a study in which a situational thinker or being an independent and critical thinker is a good predictor of task performance as well as contextual performance which includes theoretical and practical knowledge in delivering tasks and responsibilities [17].

Results provide a good picture of the quality of education that is provided Pangasinan State University – Urdueta City Campus which greatly affects the work performance of its graduates. Every BS Mathematics graduate directly experiences the relevance and content of the curriculum. The BS Mathematics curriculum provides quality instructional content requiring the expected competencies that each student should acquire. The institution also provides relevant experiences to its students on how to serve the community through different extension projects and outreach programs. This is reflected in the program outcome for each graduate to be socially aware.

Table 3. Variables Included in the Model in Each Work Performance

Work Performance	Variables Included	B	t	Sig.	R ² _{adj}
A. Theoretical and Practical Knowledge in Delivering Tasks and Responsibilities	Constant	.291	0.866	.392	77.40%
	Independent	.349	3.419**	.001	
	Socially Aware	.346	3.691**	.001	
	Investigative Independent & Critical Thinkers	.235	3.121**	.003	
B. Trainability of Employed Graduates on the Skills Needed for the Job	Constant	.977	2.538*	.015	66.00%
	Adaptive	.525	5.207**	.000	
	Well-Rounded	.253	2.538*	.015	
C. Carries Positive Work Attitude such as Teamwork, Confidence, Self-Motivation	Constant	1.238	3.009**	.005	57.40%
	Adaptive	.429	3.462**	.001	
	Subject Specialist	.297	2.324*	.025	

****Significant at 1%, *Significant at 5%**

Two factors were also found to be significant predictors of the trainability of the graduates. Adaptability and well - rounded are viewed as a major component of performance on the trainability of graduates. It is interesting to note that the BS Mathematics program is exposed to several allied fields of mathematics particularly IT and Statistics.

Being adaptive and subject-specialists were regarded to be good predictors of the positive work attitude of the BS Math graduates. It is also good to note that adaptivity assumes a huge role in the work performance of BS Math graduates. It is well noted that this graduate outcome is one of the major foci of the program. Fragment is given attention to students by exposing them to on-the-job (OJT) training integrating new learning experiences and exposing them to the actual work setting. In addition, the BS Math program also provides faculty members with a diverse professional and educational background providing new ideas, and methods of teaching and learning. Such background produces supplementary opportunities and encourages graduate outcomes for BS Mathematics students that industry and society need, such as adaptability and well-rounded.

Several studies determined the association between more specific abilities and work performance. A subject specialist is defined by several specific abilities which include verbal, numerical, perceptual, and special abilities. These abilities were discovered to be

significant predictors of job performance. [18]. The result is also supported by the study of Ree et al. [19] which concluded that particular abilities added significantly to the prediction of job performance.

Practically, it is critical to determine and identify the predictors of work performance. It is well noted that performance is not static. Performance is not stationary. Stewart [20] contended that factors such as training, target setting, encouraging interventions, emotional states, age, as well in situational circumstances can simply reshape the performance.

In sum, many work performance is a means to focus on specific expectations of a program. Modeling such performance is critically important to the programs as it provides an interesting glimpse into how graduates might change and develop. Likewise, it offers a value for feedback and developmental resolutions as it provides relevant information on the behavioral changes necessary to improve the satisfaction of employers on the work performance of BS Mathematics graduates.

CONCLUSION AND RECOMMENDATIONS

The study provides an insight into the perception of employers on the work competency based on program outcomes and satisfaction on the job performance of the BS Mathematics graduates. Graduates were rated outstanding in terms of their competence in well – rounded and ethically aware. They gave the BS Mathematics graduates a high performance in valuing and promoting truth, accuracy, honesty, accountability, and ethical standards, recognizing the need for work, and the capacity to take part in long-lasting learning. Graduates were also given a satisfactory rating as a subject specialist, investigative, independent, critical thinkers, confident and effective communicators. Notably, employers were very much satisfied with the work performance of the graduates in terms of knowledge on work, trainability, and work attitude. Several graduate outcomes can be used to predict the employers’ rating on the work performance of the BS Mathematics.

The result provides pointers for those areas of skills development that the BS Mathematics program needs to revisit and thus delivering a mechanism for curriculum design and revision. Bowden and Marton [21] suggest that the curriculum for any university must prepare students to be able to apply to the requirements of the industry and other interested parties. The University should supplement its curricular programs by identifying relevant program outcomes to further enhance the graduate's personal attributes and competencies in the global industry environment.

Include employers in the regular curriculum review of the program offered which will also evaluate the relevance of the subjects offered and may consider subjects that will induce students to develop critical and analytical thinking. Identifying the competitive performances of both local and international industries needs to be strengthened which will be the basis of the program outcomes. In addition, program outcomes should be monitored periodically to ensure their continued relevance to achieve the objectives of outcomes-based education. Although the study revealed favorable ratings from the employers, it recommends that the need for continuous and systematic monitoring on the feedback performance to consolidate the viewpoints of the work setting. Further, the academic institution should continue monitoring the graduate's work performance by identifying the differences between developments of learning in the classroom and the requirement of their actual workplace in the industry.

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