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Determinants of Performance of Graduates in the Medical Technologist Licensure Examination

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Abstract - The public gauges the quality of academic programs of a school from the results of licensure examinations. School leaders use the examination basis for intervention programs to upgrade quality. This study aims to find the factors of performance of San Pedro College graduates in the Medical Technologist Licensure Examination (MTLE). Mixed – methods research design was utilized in describing the predictors of the graduates' performance in the MTLE. A total of 304 graduates distributed according to the year of graduation from 2005-2009 who took the MTLE on September of the same year they graduated were subjects of this investigation. Results of this study demonstrated that all independent variables were correlated with the performance of the graduates in the MTLE, with clinical internship WPA having the highest coefficient of correlation of .540. Further analysis using stepwise regression model revealed that clinical internship WPA is the best predictor for passing the MTLE. This may

suggest that a strengthened internship program would help improve the graduates' performance in the MTLE. Thus, it is recommended that consultations from students, alumni, and faculty be done to draw out suggestions on how to improve the existing practices of the internship program. The results also demonstrated that there is a low negative correlation between DAT and MTLE. This may mean that higher DAT is not a guarantee that the graduate will perform in the MTLE.

Keywords - board examination, internship program, clinical internship, medical technology

INTRODUCTION

Education is continually evolving. This is particularly true in Medical Laboratory Science/Medical Technology Education which aims to develop a foundation in the fundamentals of medical laboratory science and to make it responsive to the demands for manpower in the paramedical service utilizing the highly innovative technologies. It consists of clinical laboratory testing which plays a crucial role in the detection, diagnosis, prognosis, prevention and treatment of diseases such that medical technologists/medical laboratory scientists must have a combination of education, clinical laboratory internship and specialized training (CHED CMO No. 14 s 2006).

Medical technologists play a very important role in the healthcare system along with other health professionals. Clinical decision-making affect patient care and is based largely on results of medical laboratory tests. Up to 85% of a patient's health record is comprised of laboratory results. Medical technologists enable accurate, reliable clinical diagnoses and support preventive disease management (White Paper, 2010).

Over the years, the spectacular advancement in technology, changing social needs, medical practices, and new attitude towards hospitalization brought about changes in the role of medical technologists. There is greater emphasis on quality assurance and professional accountability. Hence, the professionals should continually update their knowledge, skills, attitudes, and values to keep up with the constant pace of change.

Educational institutions for the medical technology profession are also affected by these changes. There is a continuous updating of curriculum to conform with the changes in the profession while maintaining or improving the quality of education. However, the maintenance of high standards of academic excellence and the production of competent graduates are two of the major problems encountered by higher education institutions (HEIs).

With academic excellence in mind, schools submit for voluntary accreditation as practiced today along with improving performance in licensure examinations. The former Professional Regulation Commissioner Hermogenes Pobre stressed that "every professional is forged on the anvil of education; he is as competent as the kind of education with which he is fashioned." Therefore, providing quality education is a primordial goal of every institution.

At San Pedro College, success in licensure examination is an important outcome measure in assessing the effectiveness of an educational program. While San Pedro College (SPC) MT graduates comprise most of the work force in both public and private laboratory health facilities in Davao City, for the last five years, though the school produced topnotchers in the Medical Technologist Licensure Examination (MTLE) given by the PRC, it is observed that the performance of the graduates is not consistently at par or above the national passing percentage.

It is in this light that the researchers ventured to conduct this investigation to find out if the type of high school the student graduated from, the high school general average, the kind of students admitted to the program through their Differential Aptitude Test (DAT), general education Weighted Point Average (WPA), professional subjects WPA, and clinical internship WPA could strongly predict the performance of the graduates in the MTLE.

The Medical Technology Profession

Medical technology (MT) is a profession concerned with providing information based on the performance of analytical tests on human body substances to detect evidence of or prevent disease or impairment and to promote and monitor good health. These laboratory measurements and examinations provide hard scientific data used to deal with

problems identified by the clinical evaluation and are an essential part of the information that contributes to the patient data base.

The Philippine Association of Medical Technologists (PAMET), founded in 1964, is the national organization of registered Medical technologists in the Philippines. One of its biggest achievements was the approval of the Republic Act (R.A) 5527 entitled " The Medical Technology Act of 1969 " which governs the practice of this profession (Rabor, Navarro & Pasia, 2010).

Quality Medical Technology Education

Considering the dynamic changes in the medical technology profession, the Commission on Higher Education (CHED) through the recommendation of the Technical Panel for Medical Technology Education, mandated the application of CHED Memorandum Order (CMO) No.14 s. 2006 otherwise known as "Policies, Standards, and Guidelines for Medical Technology Education." The medical technologists/medical laboratory scientists must have a combination of education, clinical laboratory internship and specialized training (CMO No. 14 s 2006). HEIs are now engaged in reforms to improve academic quality and operational efficiency and to enhance economic competitiveness (International Institute for Educational Planning IIEP, 2009). In the Philippines, HEIs are under the supervision of Commission on Higher Education (CHED). CHED recognizes schools as a Center of Excellence or Center of Development in order to challenge HEIs to attain the highest degree or level of standards along the areas of instruction, research and extension.

To ensure that academic excellence is achieved, the Commission on Higher Education (CHED) through the Technical Panel for Medical Technology Education, PASMETH and HEIs offering Medical Technology adopted measures to advance development of the academic and clinical training of would-be medical technologists.

BS Medical Technology Program in San Pedro College

In keeping with the mission and vision of San Pedro College, the institution responded to the growing demand for proficient

laboratory personnel by offering the course Bachelor of Science in Medical Technology (BSMT). This is a four-year program that aims to provide quality education and training in the performance of clinical laboratory procedures that aid physicians in the correct diagnosis, treatment, and prevention of diseases. The program consists of general education subjects and professional subjects. The general education and core subjects are offered in the first two years while the professional courses are offered in the third year level. The internship program in the fourth year covers 10 months of clinical exposure in accredited training laboratories/agencies. Sections for rotational duties include: Clinical Chemistry, Hematology, Histopathology/Cytology, Immunohematology, Immunology and Serology, Microbiology, Parasitology, and Urinalysis and other Body Fluids (Clinical Microscopy). The fourth year level also includes Seminar (Selected Topics) and the Continuing Education Program (CEP).

Students

Student factors such as the nature of school they finished high school, result of the college admission test, and scholastic achievement during college could influence the success rate in the MTLE. A literature search produced negative result regarding success indicators in the MTLE. But there were several studies from other health professionals, particularly in the National Council Licensure Examination for Nurses (NCLEX), that reported the use of standardized entrance examination, student aptitude test, and grade point average (GPA) as having significant findings in relation to NCLEX passing rates (Crow *et al.*, 2004).

Faculty and Instruction

Providing quality education should be the primordial goal of every learning institution. The World Education Forum in Dakar in 2000 emphasized the need to achieve education for all, but noticed the need to improve the quality of education. The Forum made the following recommendation: "*Improve all aspects of the quality of education to achieve recognized and measurable learning outcomes for all-especially in literacy,*

numeracy and essential life skills" (Dakar Framework for Action Article 7, World Education Forum, 2000). Quality education is a result of quality teachers and quality instruction.

CHED's minimum requirement for teachers in HEIs should be at least with master's degree. This is clearly stated in Section 13 of CHED Memo No.14 s. 2006, "*A faculty member teaching licensure and non-licensure Medical Laboratory Science subjects shall have academic preparation appropriate to teaching assignment and should be a holder of a Master's degree in Medical Technology and other health related fields".* The competence of these teachers with the degrees shall greatly influence the learning process of students (as cited in De la Pena, Bauyot & Galendez, 2008).

Equally significant to faculty preparation is instruction. Most reforms and improvement strategies deal with what is going on in the classroom. Advances in education depend largely on the qualifications and the pedagogic and technical qualities of the individual teacher. Particularly in MT education, teachers must master a repertoire of instructional methods and strategies for the students to develop the competencies adequate for the practice of MT profession.

In this light, teachers have to be continually motivated to perform their roles faithfully and enthusiastically. Carron & Chau (1996) pointed the importance of teacher motivation towards their jobs. One of the main findings of a report was that teachers' motivation was fragile and declining. They noted "*There is a strong link between teachers' motivation and performance, and education quality, but improving teachers' motivation is not uniformly prioritised as a major concern of national and international policy-makers*" (Voluntary Service Overseas, 2002). Factors that reduce teacher's motivation should be addressed by every learning institution to attain success in education interventions.

Performance of the Graduates in the Board Examination

The primary objective of every professional licensure examination is to obtain valid and reliable information as to whether examinees possess the technical competence required for admission to the profession. Technical competence includes technical knowledge, the ability to apply such knowledge skillfully and with good judgment and

an understanding of professional responsibility. School performance in licensure examination is an important outcome measure in assessing the effectiveness of an educational program. Hence, graduates of HEIs in Medical Technology are challenged to perform in the MTLE at par with the national passing percentage. Graduates of an institution with a high passing percentage are regarded as highly competent because of the kind of education they get from the institution (de la Peña *et al*., 2007).

HEIs with performance which is not consistently at par with the national percentage should look into factors that would predict the performance in MTLE, thus, the necessity to do this study.

FRAMEWORK

This study employed the systems approach in evaluating the MT education program in San Pedro College.

School as an organization is a system. A system is a set of things that affect one another within an environment and form a larger pattern that is different from any of the parts (Schwaninger, 2000). System theory is a way of viewing school as a learning organization (Lurenburg & Ornstein, 2004).

The fundamental systems-interactive paradigm of organizational analysis features the continual stages of input; throughput (processing); output, which demonstrate the concept of openness/closedness; feedback; and, environment (Littlejohn, 2001).

Figure 1 depicts the paradigm of the study, which is premised on the assumption that the type of high school the student graduated from, the high school general average, general education WPA, professional subjects WPA, clinical internship WPA, and overall WPA of the Medical Technology graduates contribute to their board examination performance.

The relationship that exists between the input and output variables identified is also affected by the teaching-learning process that takes place in classroom instruction, teaching-learning practices and how they put into practice the theoretical foundation during internship. The graduates' performance in the MTLE will give feedback which among them is a strong predictor in the board exam and how efficiently the processes are implemented.

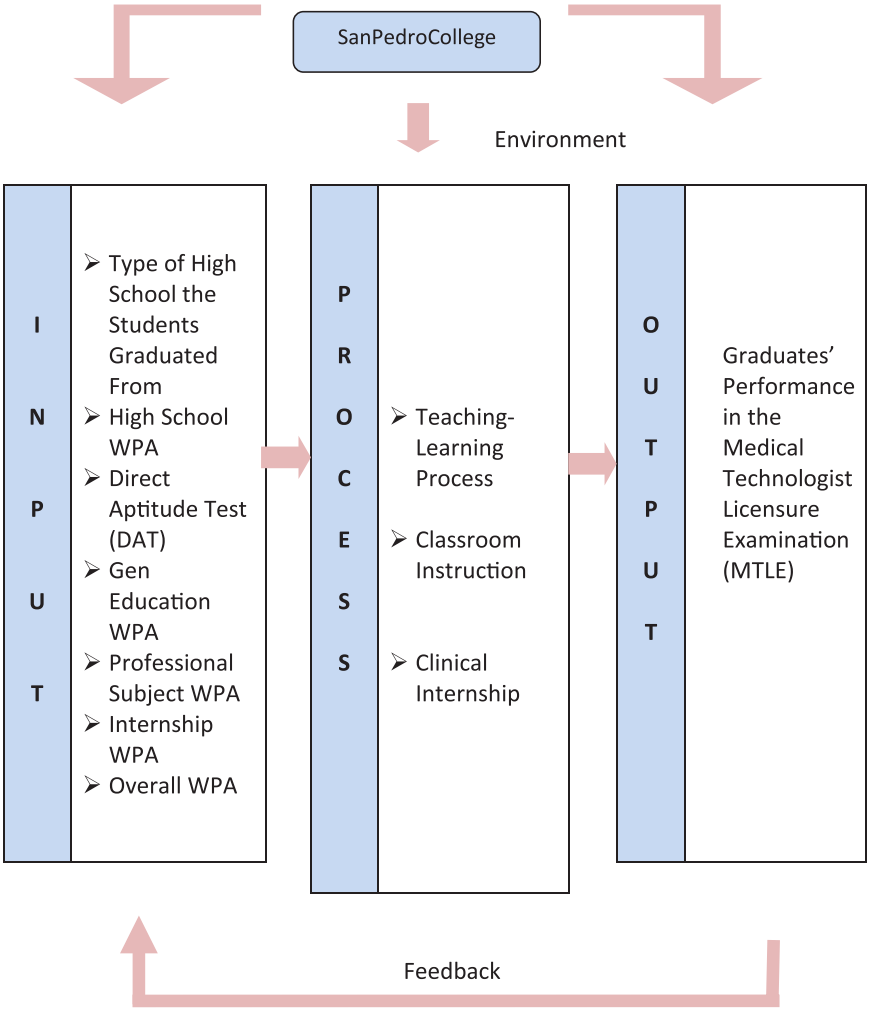

Figure 1. Paradigm of the study

OBJECTIVES OF THE STUDY

The study determined the predictors of performance of the graduates of the medical technologist licensure examinations of San Pedro College, Davao City, Philippines.

MATERIALS AND METHODS

This institutional research employs mixed-methods research design which combines the collection and analysis of quantitative and qualitative data within one or more of, or across, the stages of the research process. Qualitative data were obtained through questionnaires and focus group discussion to gather an in-depth understanding on the experiences of the respondents while in San Pedro College. Quantitative data were provided by PRC, the school's Guidance Center, and the registrar's office following ethical considerations. A non-probability sampling was used with 304 medical technology graduates distributed according to the year of graduation from 2005-2009. Each of the subjects should have taken the licensure examination on the same year as their graduation, that is, they should have graduated March and have taken the board examination on September of the year they graduated regardless of whether the former passed or failed. Analysis was done using frequency and percentages, mean and standard deviation, Pearson *r* and multiple regression.

RESULTS AND DISCUSSION

1. Profile of Graduates' Performance in the MTLE

Table 1 reveals the result of the MTLE for the last five years from year 2005 to 2009. It can be observed that graduates of years 2006 and 2007 performed below the passing rate (75%), 70.876 and 74.133 respectively. Graduates of 2005, 2008, and 2009 performed slightly higher than the passing rate. The result further shows that generally students for the last five years performed slightly lower than the usual passing mark of 75% with a mean score of 74.3824%. Close examination of the mean performance by year of graduation suggests that elements of the BSMT program need to be improved and strengthened.

Table 1. Profile of graduates in terms of performance in the MTLE

Year of Graduation	N	Mean	Standard Deviation
2009	53	75.08*	5.750
2008	38	76.38*	6.233
2007	33	74.13	6.985
2006	79	70.88	8.272
2005	101	75.45*	5.947
Total	304	74.38	6.6374

**Above the passing mark 75%.*

2. **Profile of Students**

A. Type of Secondary School

Table 2 shows that 75% of the students admitted in the BSMT program completed their secondary education in private schools while 25% are products of public schools.

Table 2. Profile of graduates' type of high school graduated

Year of Graduation	Type of Secondary School		Total
	Private (f)	Public (f)	
2009	38	15	53
2008	28	10	38
2007	25	8	33
2006	58	21	79
2005	78	23	101
Total	227 (75%)	77 (25%)	304

B. Differential Aptitude Test (DAT)

Table 3 reveals that students performed from disadvantaged to superior in the DAT. Of the total examinees, 54.50% have average performance, 17.24% high average, 13.10% low average, 7.93% above average, superior and disadvantaged both with 1.03%.

Table 3. Profile of graduates' in terms of Differential Aptitude Test

Score	Description	F	Percentage
268-up	Excellent	0	0
244-267	Superior	3	1.03
220-243	Above average	23	7.93
196-219	High average	50	17.24
148-195	Average	158	54.50
124-147	Low Average	38	13.10
100-123	Below Average	15	5.17
99- below	Disadvantaged	3	1.03

Source: *SPC Guidance and Testing Center*

In relation to Table 3, Table 4 shows that generally, the students' performance was average with a mean score of 172.3. It can be observed in the table, however, that the graduates of 2005 (who entered in 2001) had the highest performance with a mean score of 180.45. The graduates of 2007 (who entered in 2003) performed the lowest with a mean score of 155.74.

Table 4. Level of performance of graduates' in terms of Differential Aptitude Test

Year of Graduation	Mean	SD[a]	Description
2009	175.56	34.23	Average
2008	176.21	37.67	Average
2007	155.74	41.67	Average
2006	173.54	31.38	Average
2005	180.45	28.19	Average
Total	172.30	9.5931	Average

Source: *SPC Guidance and Testing Center*

C. High School General Average

Table 5 shows that the graduates generally performed good from the schools where they completed their secondary education with a mean quantitative equivalent of 88.89.

Table 5. Profile of graduates' high school general average

Year of Graduation	Mean	SD[a]	Description
2009	88.76	4.31	Good
2008	89.44	3.31	Good
2007	88.47	3.25	Good
2006	88.74	3.15	Good
2005	89.03	3.31	Good
Total	88.89	0.37	Good

Source: *SPC Registrar's Office*

D. General Education Weighted Point Average (WPA)

Table 6 reveals that, using the usual description on how students performed in the class based on WPA, students generally performed *good* with a quantitative equivalent of 86.77. Graduates of 2006 and 2007 performed the lowest with a mean WPA of 85.79 and 85.97, respectively, which seem to be consistent with their batch performance in the MTLE (Table 1) which is below the passing mark of 75%.

Table 6. Profile of graduates' Weighted Point Average performance in general education subjects

Year of Graduation	Mean	SD[a]	Description
2009	87.60	3.04	Good
2008	86.91	4.06	Good
2007	85.97	3.50	Good
2006	85.79	3.36	Good
2005	87.59	3.16	Good
Total	86.77	0.87	Good

Source: SPC Registrar's Office

Table 7 shows that students performed fairly with a mean WPA of 83.93 in the professional subjects in Medical Technology.

Table 7. Profile of graduates' performance in medical technology professional subjects

Year of Graduation	Mean	SD[a]	Description
2009	84.10	3.08	Fair
2008	84.70	3.77	Fair

Continuation of Table 7

2007	83.34	2.99	Fair
2006	83.95	4.08	Fair
2005	83.56	3.15	Fair
Total	83.93	0.52	Fair

Source: SPC Registrar's Office

Table 8 reveals that students performed fairly with a mean score of 82.70 in their clinical internship. It can be gleaned from the table that graduates of 2006 with the lowest internship grade of 81.01 also performed the lowest in the MTLE with a mean rating of 70.88 (Table 1).

Table 8. Profile of graduates in terms of performance in internship

Year of Graduation	**Mean**	**SD[a]**	**Description**
2009	82.97	3.09	Fair
2008	83.63	6.63	Fair
2007	82.36	3.33	Fair
2006	81.01	3.46	Fair
2005	83.51	2.98	Fair
Total	82.70	1.07	Fair

Source: SPC Registrar's Office

E. Correlational analysis between the perceived factors and MTLE

Table 9 shows a correlational analysis of the MTLE with the type of high school the student graduated from, the high school general average, Differential Aptitude Test, General Education WPA, Professional Subject WPA, Internship WPA, and Overall WPA. The

factors with marked moderate correlation to MTLE include general education WPA, professional subject WPA, internship WPA, and over all WPA with internship WPA having the highest coefficient of correlation of .540. Further analysis using stepwise regression model shows that internship WPA is the best predictor for passing the MTLE. It can also be observed that both DAT and high school general average showed low correlation to MTLE with a coefficient of correlation of -0.227 and 0.246, respectively.

Table 9. Pearson correlation between the independent variables and the MTLE

Variables Correlated with MTLE	**r-value**	**p-value**	**Interpretation**
Nature of School	.175	.002	Significant (Negligible correlation)
HS GA	.246	.000	Significant (Low correlation)
DAT	-.227	.000	Significant (Low correlation)
Gen Ed WPA	.434	.000	Significant (Moderate correlation)
Prof Subj WPA	.460	.000	Significant (Moderate correlation)
Internship WPA	.540	.000	Significant (Moderate correlation)
Over all WPA	.505	.000	Significant (Moderate correlation)

Level of significance (α) = 0.05

The clinical application of theories during internship deepens the students' knowledge and understanding. Along with clinical duties, continuing education program (CEP), a unique feature of the SPC internship program, is given. It aims to reinforce the learning experience of the students and prepare them for the eventual licensure examination. Students find this very helpful as it serves as an early review for the MTLE. However, the graduates revealed that there is no difference as to teaching style and content when CEP is handled by the same teacher as in their third year subject. They also revealed that the examinations given were still highly knowledge-based and less commonly higher order thinking skills.

Research shows there's a link between critical thinking skills and increased student achievement in the classroom. In his study of test scores, Harold Wenglinsky (2000, 2003) found that teaching critical thinking is associated with higher test scores. Students learn concepts and then attempt to apply them to various problems, or they solve problems and then learn the concepts that underlie the solutions. Therefore, instruction emphasizing advanced reasoning skills promotes high student performance (Wenglingsky, 2000).

It is important to note that DAT in this investigation showed a negative low correlation to the performance of the graduates in the MTLE. This is contrary to the results of many local and international studies that aptitude tests are good predictors of the performance of the graduates in licensure and state board examinations (de la Peña*et al.*, 2007; Donnon, Younger & Grap, 1992; Donnon, Paolucci, & Violato, 2007; Manasse, Purohit, Blake & Barnes, 1980). This seems to suggest that higher DAT does not guarantee students will perform better in the MTLE. Higher DAT is currently one of the bases of admission to the BSMT program of the college.

A bench marking was done in one of the country's top performing schools in the MTLE. This school implements "open admission", where students range from disadvantaged to superior. However, the institution imposes a strict system of promotion to higher level. Their high MTLE performance is attributed to strengthened instruction and "team teaching" system of handling major board subjects. Similarly, SPC's Nursing department, one of the country's top performing schools implement "team teaching" in their board subjects. Only recently did some faculty members of the BSMT/Laboratory Science department adapted team teaching.

3. **The Faculty from 2005 to 2009**

A. Profile of Educational Attainment of the Faculty from 2005 to 2009

Table 10 shows that in AY 2005-2006 and AY 2006-2007 around 80% of the faculty are already enrolled or about to finish their respective MS/MA studies. In AY 2008-2009, 40% are graduates of MS in Medical Technology, 30% MA in Science Teaching Major in Biology, and 10%

MS in Biology. In the same year, a Medical Doctor was hired to serve as a full-time dean.

Table 10. Profile of educational attainment of the faculty from 2005 to 2009

Degree Earned	AY 2005-2006		AY 2006-2007		AY 2007-2008		AY 2008-2009	
	f	%	F	%	F	%	F	%
BSMT	1	7.69	1	9.1	1	9.1	1	10
MSMT	-	-	-	-	2	18.18	4	40
MAST-Bio	-	-	-	-	-	-	3	30
MSBio	-	-	-	-	-	-	1	10
MPH	1	7.69	-	-	-	-	-	-
Faculty enrolled in MSMT								
MA/MS	4	30.77	4	36.36	2	18.18	-	-
in related	7	53.85	6	54.54	6	54.54	-	-
fields								
MD	-	-	-	-	-	-	1	10
TOTAL	13	100	11	100	11	100	10	100

Source: *Human Resource and Development Office*

B. Students' Evaluation

Table 11 shows that from SY 2004 – 2005, faculty members of the department were evaluated either excellent or very good.

Table 11. Profile of faculty in terms of students' evaluation

Faculty	2004	2005	2006
Prof. A	E	E	E
Prof. B	VG	VG	VG
Prof. C	VG	VG	E
Prof. D	VG	VG	VG
Prof. E	VG	E	VG
Prof. F	VG	E	E
Prof. G	VG	VG	VG
Prof. H	VG	VG	VG
Prof. I	VG	E	VG
Prof. J	-	G	VG
Prof. K	G	-	-
Prof. L	VG	E	E
Prof. M	VG	VG	-

Based on the students' evaluation of the faculty handling the subjects both in third year and in fourth year (Continuing Education Program), all teachers were evaluated either very good or excellent. This suggests that teachers possess competence in the subjects they handle. However, focus-group discussion (FGD) on students who are repeaters, first time passers, and topnotchers revealed they found it difficult to understand and appreciate certain subjects because of the way their teachers present the topics.

Despite the problems the students experienced from their teachers as to teaching style, instruction, and even content, teachers are still evaluated either "very good" or "excellent". Some respondents related that when they evaluate, they remember how they were treated by the teacher. Teachers who give so much input with lesser enjoyable activities become unpopular and less appreciated. This response seem to corroborate the findings of a study that teachers who smile, laugh, have a sense of humour, are active, enthusiastic, dramatic, and easy to be with are highly regarded by students (Trim, 2007).

Effective teaching is perceived as personal characteristics of the instructors: demonstrating concern for students, valuing student opinions, clarity in communication, and openness to varied opinions (Spencer and Schmelkin, 2002). A study by Goe (2007) supports this finding. Teacher qualities exist independently of the actual act of learning, and teachers who display more concern gain favourably high regard among the students.

It appears that a "very good" or "excellent" evaluation reflects more of the teacher's personal characteristics or qualities rather than professional competencies. Depending on how the students' evaluation impact on the teacher, this may be used to improve the quality of instruction by ensuring accountability for classroom and performance or become complacent in their teaching styles with the belief that they are effective teachers.

Performance evaluation serves as formative and summative evaluations used in an official capacity by administrators and faculty for one or more of the following purposes: (a) to facilitate curricular decisions (i.e., improve teaching effectiveness); (b) to formulate personnel decisions related to tenure, promotion, merit pay, and subject loads (Gray & Bergmann, 2003; Marsh & Roche, 1993; Seldin, 1999).

Therefore, the tool used for evaluating teachers must be reviewed to achieve the goals and objectives defined in the vision, mission, and goals of the institution so as to provide a basis for instructional improvement through productive teacher appraisal and professional growth.

CONCLUSIONS AND RECOMMENDATIONS

This study concludes that from among the presumed factors that predict the performance of the graduates in MTLE, Clinical Internship Weighted Point Average is the best predictor for passing the MTLE. Conducting consultations from alumni, faculty, students, health facilities and other stakeholders on improving and strengthening the internship program of the college may impact on the graduates' performance in the MTLE. It is a challenge for the institution on how to make the internship program more relevant to the interns with

the reduction of clinical exposure to only 6 months from the usual 10 months training with the application of the new Bachelor in Medical Laboratory Science curriculum.

To further strengthen the Medical Technology Department, programs to enhance the faculty's teaching performance, faculty development seminar should be continually provided like test construction, proper use of educational technology and teaching strategies for MedTech discipline. The department should consider the possibility of team teaching to provide flexibility in giving teaching assignments to the faculty. A regular and periodic evaluation of faculty by students, peers, and supervisors to ensure complete evaluation results should be conducted to monitor the teachers' performance inside the classroom. Improving the tool for evaluation seemed relevant. The department should consider doing graduate tracer studies to determine employability of graduates among others.

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