

Assessing Critical Thinking: A Quality Assurance Initiative of a Higher Education Institution

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Abstract

This descriptive study of the performance of graduating college students of a higher education institution in critical thinking test used 2012 and 2013 results of the Terminal Competencies Assessment. Researchers converted the scores in the 15-item Critical Thinking Test to percentage scores and categorized it as Novice, Basic, Proficient, and Advanced levels. Results showed that the majority attained a Proficient level and better. Students in the Science and Technology curricula tend to score higher compared to students in the skills-based programs. No significant pairwise differences in almost all courses may suggest that students are developing their critical thinking, but this needs in-depth investigation. The positive association of critical thinking with technological facility, historical perspective, research competence, and effective communication suggests that the development of these competencies support each other. This positive association should be taken into account when teachers plan their teaching-learning activities.

Keywords: educational management critical thinking test, quality assurance, critical thinking proficiency level, graduating college students, descriptive design, Philippines.

INTRODUCTION

The faculty and administration are giving extensive attention to the quality of service offered by the universities as institutions of higher learning in many parts of the world. However, universities face rising costs, shrinking resources and increasing demands for accountability. As a step to monitor the quality of student learning outcomes, a higher education institution embarked on a university-wide student learning assessment project. The Learning Assessment Center under the Office of the Vice President for Academic Affairs managed the project. The Center seeks to foster excellence in educational practice by nurturing a culture of learning assessment. Although learning outcomes assessment is just one aspect of academic quality assurance process, it can provide evidence of the effective interplay of all other aspects. Curriculum and instruction, faculty and staff development, physical facilities, library resources, research and extension, and administration and governance are among these aspects.

The Student Learning Assessment Plan 2010-2015 anchored the learning assessment activities in the university. In the Plan, the Learning Assessment framework specifies the monitoring of the entry, intermediate, and terminal competencies of college students. Critical thinking is one general terminal competency that the university seeks to assess among graduating students together with Effective communications, Historical perspective, Civic responsibility, Technological facility, Research competence, Scientific literacy, and Information literacy. In a survey conducted by People Management Association of the Philippines (PMAP), it was reported that 40% of the applicants fail in their job interviews. Majority fail because of lack of key behavioral competencies necessary to perform in typical office situations. Top 3 behavioral competencies were initiative, communication, and critical

thinking. (The Philippine Star, Education Section, 2009)

This study focused on critical thinking as this learning outcome is repeatedly specified in the competency standards for almost all undergraduate curriculum (Philippine Commission on Higher Education Memo Order on Policies and Standards). Critical thinking is a core academic skill (Office of Outcomes Assessment, UMUC, 2006); it is one of the major practical and academic skills (Association of American Colleges and Universities [AAC and U], 1985); and one of the thinking and learning skills specified in the 21st century skills framework for graduates to be competitive in the Information and Communications Technology (ICT)-dominated formal job sector (Scharfeberger, 2006). Critical thinking is also a significant learning outcome of the general education curricular offerings at institutions (Middle States Commission on Higher Education, 2002); and one of the life skills that children and adults should possess to have a quality life. Practically worldwide, critical thinking is one of the skills that college graduates are expected to possess.

Critical thinking, as defined in the Student Learning Assessment Plan 2010-2015, is the ability to interpret information, and apply reflective processing of information. Also, it refers to the ability to respond and adapt to changing situations, make complex decisions, solve problems, and evaluate actions. The Assessment Plan stipulates that the indicators of critical thinking are as follows: interpretation, analysis, evaluation, inference, explanation, and self-regulation. Interpretation includes one's ability to understand and express the significance of different experiences, data, events, judgments, beliefs, rules, methods, or criteria. Analysis refers to the student's ability to identify the actual inferential relationships among concepts, statements, questions, descriptions, or other forms of representations designed to express reasons, belief, experiences, judgment, information, or opinions. Evaluation points to assessing the statement's

credibility or other representations of a person's perception, experience, situation, judgment, belief, or opinion; and to determine the rational strength of the actual or intended inferential relationships among questions or other forms of representation, statements, and descriptions. Indicators also include inference, that is, to identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to reduce the consequences flowing from the data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation; explanation, that is, to state and validate that reasoning in terms of evidential, methodological, conceptual, criteriological, and contextual considerations upon which one's results are based; and to present one's way of thinking in the form of cogent arguments; and self-regulation which is to self-consciously monitor one's cognitive activities. The elements used in those activities and the results deduced, particularly by applying skills in analysis and evaluation of one's inferential judgments with a view toward questioning, confirming, validating, or correcting either one's reasoning or one's results.

The university would like to monitor students' skills before they leave considering the importance of critical thinking in job placement and personal development. Have we advanced to a competitive level the critical thinking skills of our students through our teaching and learning approaches and the extracurricular opportunities we provide them? This study can give some insights if indeed the implicit objective of every course/subject to develop critical thinking was attained. This study can also provide inputs for the university's quality assurance initiatives and curricular program planning and implementation.

Objectives

This study aims to assess student performance in the critical thinking skills tests when students took as a group and when classified by academic program. Specifically, it seeks to determine the critical thinking proficiency level of students at the university program level. Furthermore, it aims to determine the association of critical thinking performance with the other behavioral competencies. The historical perspective, civic responsibility, technological facility, research competence, scientific literacy, information literacy, and effective communications are such competencies.

Conceptual Framework

Today's workers need to think critically, innovate, solve problems, collaborate, and communicate more efficiently. As illustrated in Figure 1 College graduates must excel at the "four Cs": communication, critical thinking, collaboration, and creativity (American Management Association (AMA), 2012). According to this 2012 AMA survey, job applicants are assessed in these areas during the hiring process. Likewise, according to the majority of the managers and executives surveyed, their employees are evaluated on these skills during annual performance appraisals. They believe that these skills and competencies will become more important to their organizations in the coming years. Indeed, the importance of critical thinking skills cannot be overemphasized. Where else can people learn higher order critical thinking skills but in the universities and later, in the workplaces? The level of critical thinking skills is believed to be an indicator of the career-readiness of graduating college students. Results of this study will have potential implications for the higher education institutions (HEI's) curricular, co-curricular, and extracurricular activities in terms of critical thinking skills development of students.

Critical thinking plays a central role in logical thinking, decision-making and problem solving (Liu, Frankel and Roohr, 2014; Butler, 2012; Halpern, 2003). Butler (2012) points out that educators and employers agree that it is necessary to assess the critical thinking skills of students and probable employees; and has provided evidence that scores on a critical thinking assessment can predict real-world outcomes.

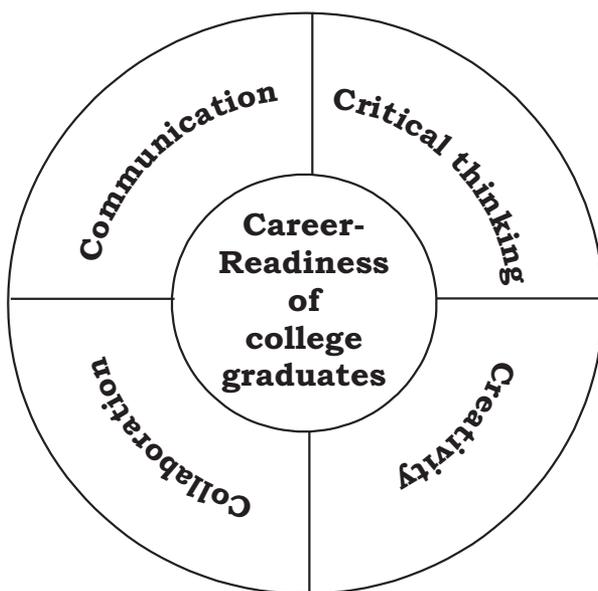


Figure 1. The four C's as an indicator of the career-readiness of college graduates.

METHODOLOGY

This study employed descriptive research method. The instrument used to assess critical thinking skills of graduating college students was constructed by the Critical Thinking Assessment Team. Through the Learning Assessment Center, the instrument was pilot-tested for examination management and testing period, and for face and content validity. A total of 15 (multiple-

choice type) items composed the critical thinking test. The test was administered together with other tests to measure students' terminal competencies. Table 1 presents the number of participants in 2012 and 2013 Terminal Competencies Assessment.

Table 1. Distribution of Graduating College Students Who Took 2012 and 2013 Terminal Competencies Assessment by Academic Program

College	Academic program/ Course	Number of students	
		2013	2012
Arts and Sciences	AB English	37	42
	AB Political Science	45	48
	BS Biology	67	41
	BS Applied Mathematics	33	30
Business and Management	B Hotel & Restaurant Mgt	36	66
	B Cooperative Management	48	43
Communication	B Journalism	27	26
	B Broadcasting	85	60
	BS Dev Communications	38	42
Education	BSEd English	40	33
	BSEd Mathematics	39	30
	BSEd Physics	13	13
	BSEd Physical Science	6	11
	BSEd Biology	12	15
	BSEd Filipino	16	19
	BSEd Social Studies	18	13
	BSpecial Education	86	88
	BEEEd Early Childhood Ed	44	33
	BEEEd General Ed	78	73
Information and Communication Tech	BS Information Technology	73	36
	BS Information Systems	70	31
Nursing	BS Nursing	137	113
PESCAR	BPhysical Education	64	49
	BMusic Education	19	8
Total		1131	963

Data analysis. Raw scores on all tests were converted to percentage scores; then means, standard deviations, lowest and highest values per group were determined. Shown below is the scale used to classify proficiency level based on percentage test score.

% Score	Proficiency level
below 25	Novice
25-49.99	Basic
50-74.99	Proficient
75 and above	Advanced

Means, standard deviations, proportions, cross tabulations and a bar graph were used to describe the data. At 0.05 level of significance, analysis of variance (ANOVA) was used to compare group means when students were grouped by academic program/specialization. Scheffe's test for pairwise comparison of means was used as post hoc analysis for significant ANOVA.

RESULTS AND DISCUSSION

The summary statistics of 2012 critical thinking ratings by academic program revealed that the 963 participants posted a mean percentage score of 52.8 ($SD=14.1$). This indication shows that the batch, on the average, is Proficient in critical thinking. Of the total number of participants, the lowest critical thinking rating is 6.7%; highest is 87%, and they belong to the BS Nursing, BSEd Physics, and AB English programs.

The 2013 Critical thinking summary results showed a slight increase in 2013 overall mean rating ($mean=53.4$) compared to 2012 results is observed. See Figure 2. Lowest score is still 6.7%, but the highest score increased to 93.3%, this time the overall highest scorer is a

BS Information Technology student. Highest rating obtained by the top 4 groups is 87%.

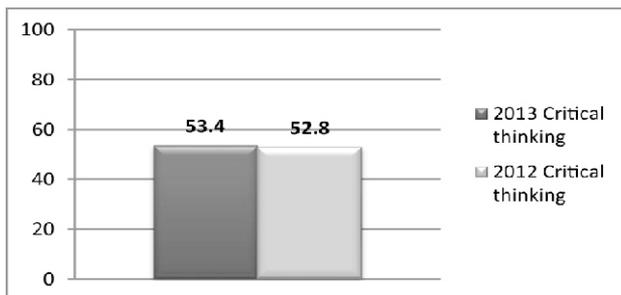


Figure 2. Mean percentage scores of students in critical thinking skills in 2013 and 2012.

The top 5 groups in terms of 2012 mean ratings are BS Nursing, BSEd Biology, BSpecial Education, BS Applied Mathematics and BS Biology with means 64.13, 57.78, 57.72, 57.11 and 56.92 respectively. Likewise, the top 5 groups in 2013 Critical thinking test are BS Nursing, BSEd Physics, BS Biology, BSEd English and BS Information Technology. The means acquired are 63, 62.1, 59.9, 59.2 and 57.3 respectively. On the other hand, the lowest five (5) groups in terms of 2012 nominal mean scores are BPhysical Education, BMusic Education, BSEd Physical Science, BHotel&RestaurantMgt, and BJournalism. They have means of 40.14, 41.65, 44.25, 47.18, and 47.43 respectively. In the 2013 assessment, the lowest five (5) groups based on nominal mean ratings are B Physical Education, BMusic Education, BElementary Education (Early Childhood Ed) BHotel & Restaurant Mgt and BSEd Physical Science.

For the 2012 comparison of group means, Analysis of Variance was employed at 0.05 level of significance. Results showed an F-value of 8.775 associated with the p-value of 0.000. (See footnote of Table 2.) This outcome led to the rejection of the hypothesis of equal means. Scheffe's test for pairwise comparison of means at 0.05 level of significance revealed that the average of the BS Nursing

group is significantly higher than the means of BPhysical Education and BMusic Education. (See different letter superscripts *a* and *b* indicating significant differences at 0.05 level of significance.) All other group means are statistically equal.

Observation in the comparison of group means of 2013 Critical thinking scores by academic program gives an almost similar result. An F value of 12.398 with a p-value of 0.000 was computed, rejecting the null hypothesis of equal means. Scheffe's test for pairwise comparison of means indicated significant differences in BS Nursing and BPE, BS Nursing and BME, BSEd Physics and BPE, BSEd Physics and BME at 0.05 level of significance. Other academic programs do not significantly differ in terms of the critical thinking mean ratings.

Table 2. Summary Statistics of Critical Thinking Percentage Scores of the Top and Lowest Five Academic Programs in the 2012 Terminal Competencies Assessment

Academic program	Mean	SD	Minimum	Maximum
BS Nursing n=113	64.13 ^a	13.49	33.3	86.7
BSEd Biology n = 15	57.78 ^{ab}	12.26	40	80
BSpecial Education n=73	57.72 ^{ab}	12.029	33.3	80
BS Applied Mathematics n=30	57.11 ^{ab}	12.465	33.3	80
BS Biology n=41	56.92 ^{ab}	12.304	20	80
BJournalism n=26	47.43 ^{ab}	14.019	20	73.3
BHotel & ResMgt n=66	47.18 ^{ab}	12.776	13.3	80
BSEd Physical Science n = 11	44.25 ^{ab}	15.563	20	66.7
B Music Education n=8	41.65 ^b	11.673	20	53.3
BPhysical Education n=49	40.14 ^b	13.365	6.7	66.7
Total n=963	52.8	14.102	6.7	86.7

F value = 8.775 P value = 0.000 *a, b Significant differences at 0.05 are indicated by letters.*

The significant differences may be attributed to the disparity in the admission and retention policies applied to these programs. BS Nursing being a quota course in the University adheres to the strict implementation of the

student selection guidelines. In addition, the program consistently attracts the best high school applicants as revealed by the College Admission Trend study (Nepomuceno, 2008). BPhysical Education and BMusic Education programs require special talents and skills and do not emphasize on the academic readiness of their freshmen entrants.

Table 3. Summary Statistics of Critical Thinking Percentage Scores of the Top and Lowest Five Academic Programs in the 2013 Terminal Competencies Assessment

Course	Mean	SD	Minimum	Maximum
BS Nursing n=137	63.0 ^a	12.55	26.7	86.7
BSEd Physics n=13	62.1 ^a	12.88	46.7	86.7
BS Biology n=67	59.9 ^{ab}	12.74	33.3	86.7
BSEd English n=40	59.2 ^{ab}	12.10	26.7	86.7
BS Information Technology n=73	57.3 ^{ab}	12.06	33.3	93.3
BSEd Physical Science n=6	46.7 ^{ab}	15.75	26.7	73.3
BHotelRes&Mgt n=36	46.1 ^{ab}	16.44	6.7	73.3
BEEd ECE n=44	45.6 ^{ab}	11.76	20.0	80.0
Bmusic Education n=19	41.8 ^b	11.51	20.0	53.3
Bphysical Education n=64	40.4 ^b	12.05	13.3	66.7
Total n=1131	53.4	13.92	6.7	93.3

F value = 12.398 P value = 0.000 a,b Significant differences at 0.05 are indicated by letters.

When the results of two successive years (2012 and 2013) were compared in nominally, there seem to have direct similarity. Courses that belong to top scoring groups in 2012 appear to maintain their rank in 2013 with very slight movement. Likewise, groups with low ratings in 2012 also belong to the bottom bracket in 2013, and average scorers maintained their ranks for two years. Majority of programs at the College of Education improved their ratings in critical thinking with the top 3 highest gainers: BSEd Physics, BSEd English, and BSEd Social Studies. BS Nursing remained the high scorer with a slight

decrease in the 2013 rating as shown in Figure 3.

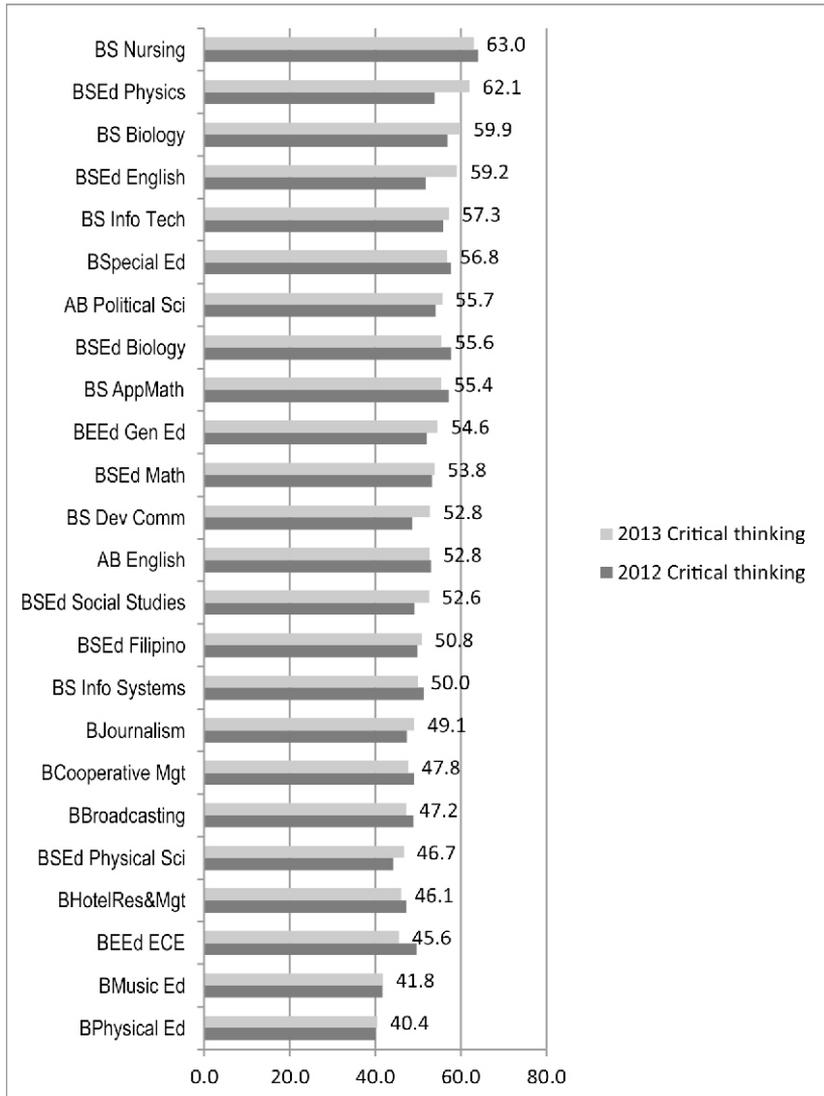


Figure 3. Mean percentage scores of students in critical thinking skills in 2013 and 2012 by academic program.

Noteworthy is the classification of the top scoring groups that belong to science and technology category (except BSEd Eng and BSpEd). The low scoring groups appear to be skills-oriented programs (except BSEd Physical Science). Recalling competencies that compose critical thinking will logically develop these skills among students. Those competencies are interpretation, analysis, evaluation, inference and explanation, science and technology curricula, as well as English or communication programs. This fact is because critical thinking entails effective communication and problem-solving activities (Paul & Elder, 2008). Elder (2007) further posited that people who critically think, use concepts and principles that enable them to analyze, assess and improve thinking. But the statistical equality of means among the majority of the programs may point to general education subjects as key factors that influence development (or non-development) of these skills. These general education subjects are familiar to all. Programs differ in the offerings of major subjects. If it is their exposure to their areas of specialization that make them critical thinkers, results could have shown significant differences in every group. For instance, AB Political Science, with their higher courses in Logic and other courses requiring analysis including their constant exposure to debates, should have made them good critical thinkers. Likewise, problem-solving exercises of BS Applied Mathematics and BS Information Technology should have made them more analytical and excellent in the evaluation. The mean ratings of these three programs, however, did not reach the 60% mark, the standard passing cut off.

Table 4. Distribution of Students in the Top and Lowest Five Academic Programs by Proficiency Level in 2012 Critical Thinking Test

Course	Proficiency Level			
	Novice %	Basic %	Proficient %	Advanced %
BS Nursing n=113		18.6	67.3	14.2
BSEd Biology n=15		26.7	60.0	13.3
Bspecial Education n=73		30.1	64.4	5.5
BS Applied Mathematics n=30		30.0	60.0	10.0
BS Biology n=41	2.4	24.4	68.3	4.9
Bjournalism n=26	3.8	46.2	50.0	
BHotel&ResMgt n=66	4.5	59.1	34.8	1.5
BSEd Physical Science n=11	9.1	45.5	45.5	
Bmusic Education n=8	12.5	50.0	37.5	
Bphysical Education n=49	10.2	63.3	26.5	
Total n=963	1.9	40.5	53.9%	3.7

Tables 4 and 5 present the distribution of students by academic program and proficiency level in 2012 and 2013 Critical thinking test, respectively. The top scoring groups appear to maintain their allocation at the different skill levels, and the low scoring groups exhibited the same pattern. The University aspires that their graduates would have attained at least Proficient level in critical thinking. For the top and average scoring groups, majority of the students are Proficient. Among the low scoring groups, majority attained a Basic level.

Parallel findings are reported by 2012 American Management Association Critical skills survey (AMA, 2012) where majority of executives admit their employees are "average" at best in critical thinking. In the same survey, managers and executives said that this skill is one of the articulated priorities within their organization.

The result of this study indicates that in terms of critical thinking skills, some programs have prepared

their students adequately; other programs produced for the workplace moderately prepared students. Other programs have to compensate for their lack of critical thinking skills with other critical skills needed in the workplace for them to be considered career-ready.

Table 5. Distribution of Students in the Top and Lowest Academic Programs by Proficiency Level in 2013 Critical Thinking Test

Course	Proficiency Level			
	Novice %	Basic %	Proficient %	Advanced %
BS Nursing n=137		16.1	67.9	16.1
BSEd Physics n=13		15.4	61.5	23.1
BS Biology n=67		23.9	65.7	10.4
BSEd English n=40		17.5	75.0	7.5
BS Information Technology n=73		23.3	71.2	5.5
BSEd Physical Science n=6		66.7	33.3	
BHotelRes&Mgt n=36	11.1	41.7	47.2	
BEEEd ECE n=44	2.3	63.6	31.8	2.3
Bmusic Education n=19	10.5	52.6	36.8	
Bphysical Education n=64	4.7	71.9	23.4	
Total n=1131	1.6	37.8	55.4	5.2

Table 6. Correlation of Critical Thinking Scores with other Behavioral Competencies Scores

Behavioral competencies	Correlation	
	coefficient	P-value
Technological facility	0.335*	0.000
Scientific literacy	0.322*	0.000
Research competence	0.316*	0.000
Effective communications	0.281*	0.000
Historical perspective	0.259*	0.000
Information literacy	0.225*	0.000
Civic responsibility	0.066*	0.000

* p < .001

Table 6 presents the association of critical thinking scores of students with their scores in other behavioral competencies. Historical perspective, civic responsibility,

technological facility, research competence, scientific literacy, information literacy and effective communications are among skills. Results showed that critical thinking correlated positively and significantly with all other skills. Highest nominal association is observed with technological facility ($r = .335$) followed by scientific literacy ($r = .322$). Critical thinking with civic responsibility ($r = .066$) is least associated. This result seemed not support Elder (2007) when she claimed that people who are critical thinkers "strive to improve the world by contributing to a more rational civilized society". However, the significant results indicate that as students develop certain behavioral competencies, it has a synergic effect on other critical skills needed by employers and the industry.

CONCLUSIONS

Critical thinking is a powerful resource for one's personal and civic life. As defined by experts (Levens, 2006), the ideal critical thinker is trustful of reason, habitually inquisitive, well-informed, open-minded, fair-minded in evaluation, honest in facing personal biases. Furthermore, he is prudent in making judgments, clear about issues, willing to reconsider, orderly in intricate matters, diligent in seeking relevant information, reasonable in choosing criteria, focused in inquiry and constant in seeking results which are as precise as the subject and the circumstance that investigation permits. These are the university traits envisioned to be possessed by graduates if they are to become leaders in their fields of specialization. The big challenge is how to measure these characteristics and how to equip students with this critical skill needed in the workplace.

Based on the results, Science- and Technology-based programs seem to develop better critical thinking skills than skills-based programs (BPhysical Education,

BMusical Education, BJournalism, BHotel & Restaurant Management). However, majority of the programs do not significantly differ in the critical thinking mean ratings. Although it requires thorough investigation, this study would like to advance that the General Education courses required of all students are a crucial factor in developing critical thinking skills. Otherwise, if it is their area of specialization, significant findings could have been observed. Or probably, the interpretation, analysis, evaluation, inference, and explanation competencies of students were not fully developed in the lower years. This viewpoint shows that they were not fully utilized in developing higher order critical thinking skills when learning competencies in their areas of specialization. The relatively higher mean of the BS Nursing group can be attributed to their stringent student admission and retention policies and the fact that they consistently topped the college admission test of the university. The university aspires that all students should be at least Proficient critical thinkers. Although it was not attained, majority of the students are at this comfortable level.

The positive association of the different general terminal competencies should be an excellent basis for more emphasis on behavioral skills in the teaching and learning processes as they reinforce the development of each other. Probably, more exercises, which will enable students to figure out solutions to complex problems and communicate these solutions effectively to others should be introduced in the classroom and organized outside the classroom. With its explanation and interpretation components, indeed effective communication skills can also enhance critical thinking.

In the classroom setting, sometimes teachers, when pressed of time constraint, have to prioritize certain topics. With the results of this terminal competencies assessment, teachers should exercise with prudence the decision whether to drop some items that they deem less

relevant or put more emphasis on certain issues that are more important to the academic program of students being handled. The reason is that this may put aside individual behavioral competencies that are essential life skills or can make students more competitive. The teachers need to practice, "less is more".

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