Effects of Classroom Assessment on the Critical Thinking and Academic Performance of Students

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Abstract *- The study was undertaken to evaluate the classroom assessment employed by the teachers, the critical-thinking and academic performance of the students in the laboratory high schools (LHS) of Central Bicol State University of Agriculture, school year 2012-2013. The descriptive-evaluative, descriptive-correlation and descriptive-comparative methods of research were used. The findings revealed that only 11 out of 50 types of classroom assessment techniques are being used in the two laboratory high schools of CBSUA, namely: CDE-LHS and CDE–CSHB. Except for the use of human tableau or class modeling and application cards in few instances, the other techniques used by the teachers were classified as low-order thinking skills like "remembering" and "understanding". "Applying", "analyzing", "evaluating" and "creating" were rarely used by the teachers. There were significant differences in the levels of critical thinking among the second year students in the two LHS along remembering, understanding, analyzing and evaluating while for third year high school students in the two LHS there was significant difference in evaluating but not significantly different with the rest of the levels. In terms of students' academic performance in Science and "remembering"; English and "evaluating" in school A, there was a significant relationship between the level of critical thinking among students and their academic performance in the three subjects. The teacher-related factors along gender, marital status, employment status, and number of awards received, were significantly associated with the questioning skills of the teachers. In general, the findings indicated that there were significant association between the student-related factors and the different levels of critical thinking.*

Keywords: Assessment, Critical-thinking

I. INTRODUCTION

One of the aims of education for the 21st Century is to cultivate the problem solving, higher-order thinking and critical thinking skills necessary for students to adapt to the rapidly changing "Information Age" (Greenspan, 2001). It is then the responsibility of the educators to empower the youth for them to adapt in a world that is increasingly dependent upon the intellectual skills and informed actions of all people.

The concept of higher order thinking is derived from the Taxonomy of Educational Objectives popularly known as Bloom's Taxonomy which had been adopted for classroom use and instructional model until lately, Lorin Anderson (former student of Bloom) revisited the taxonomy. This system identifies a hierarchical progression that categorizes lower to higher order levels of cognitive processing. The first two levels of Bloom's Taxonomy have generally been regarded as lower order thinking, while the remaining four levels have been classified as higher order thinking (Miller, 1990). The four levels of higher order thinking are the levels to which educators have been increasingly charged with teaching, thereby promoting students' higher-order thinking abilities.

Developing the lifelong skills of the students which primarily encompass their critical thinking cum creative thinking skills and problem solving depends on how the teachers play their roles. The development of these skills based on the different taxonomies of learning whether the old or the new one can be done in the different facets of instruction, namely formulation of objectives, teaching methodologies used and assessment of learning. In this study, the development of the critical thinking was focused on the assessment part. This is critical in determining the success of the goals set by to the two distinct laboratory high schools of Central Bicol State University of Agriculture. One is designed to develop the students using information and communications technology and to make them responsive to the demands of the information age, while the other promotes the development of technologies in agriculture, the backbone of the country's economy.

Whatever is the field of concentration of these laboratory schools, it is the duty of the teachers to develop the students' critical thinking skills to make them effective learners. One way to develop the critical thinking skills of the students is through the art of questioning by the teachers in both written and oral discourse. It is important to note that classroom assessment can be both a teaching approach and a set of evaluation techniques. The first approach assumes that the more you know about what and how students are learning, the better you can plan learning activities to structure your teaching. As an evaluation technique, the classroom assessment provides teachers and students useful feedbacks on the teaching–learning process.

Education as a process delivers for the student-learners two unparalleled yet connected things: the subject matter, educational discipline or simply the content which can be summed up with a simple question of *"what to think?",* and on

the other hand is the correct way to understand, digest and evaluate this subject matter, or the question on *"how to think?"*. Teachers may have done excellent job of transmitting the content of the respective academic disciplines, but often fail to teach students how to think effectively about this subject matter, that is, how to properly understand and evaluate it. This second ability is termed as critical thinking.

The ability to think critically is a skill separating those who can provide change or those who simply follow. Moreover, critical thinking reduces the power of the trivial few, the unscrupulous and the pretentious, and can neutralize the sway of an unsupported argument. If students will realize how beautiful this skill is, the more that they will be motivated and enjoy learning because they will see immediately that it gives them more control.

Critical thinking is a lifelong skill that will allow him to see beyond what is superficial. This is especially important today because everyone is surrounded by illusions many of them are deliberately created. The effects may be subtle, or they may affect people profoundly. While some people will buy and appreciate these illusions which come in different forms, these illusions can make one miserable and even baneful. Since students are always bombarded with information, they need tools of critical thinking to analyze all these inputs to be able to process them and come up with the best judgment.

Thus, every educator is in a position to teach students how to gather information, evaluate them, screen out distractions and think for themselves and others. Because critical thinking is so important, every educator does not only have the opportunities, but also the obligation to incorporate critical thinking into the subject area, hence this study.

II. OBJECTIVES OF THE STUDY

The study was undertaken to evaluate the classroom assessment employed by the teachers, the critical-thinking and academic performance of the students in the laboratory high schools (LHS) of Central Bicol State University of Agriculture, school year 2012 - 2013. The objectives of the study were to: identify the different assessment techniques used by teachers; determine the cognitive levels of questions employed by the teachers in written examinations and class sessions; determine the cognitive levels of questions raised by the students; assess the level of critical thinking; compare the levels of critical thinking between the same year level of the two laboratory high schools; relate the assessment techniques used by the teachers and the critical thinking skills of the students; assess the academic performance of the students in Mathematics, Science and English; relate the assessment techniques and the cognitive level of questions used by the teachers to the academic performance of the students in English, Math and Science; relate the cognitive level of the questions asked by the students, and their level of critical thinking with their academic performance; and identify the different factors that are associated with the questioning skills of teachers and students' as well as students' critical thinking.

III. MATERIALS AND METHODS

This study employed descriptive-evaluative, comparative and correlational methods of research. The descriptive-evaluative method was used to describe the different types of classroom assessments utilized by the teachers; the cognitive level of questions used by the teachers in written and class sessions; and cognitive level of questions raised by the students. The same method was employed in the assessment of the level of critical thinking skills and the academic performance of the students in Mathematics, Science and English.

The descriptive-correlational method was used to determine the relationship between the level of critical thinking skills and the academic performance of the students in Mathematics, Science and English; and in determining the factors that influence the questioning skills of students and teachers as well as students' critical thinking.

The descriptive-comparative method was employed in the comparison of the level of critical thinking of students by year level in the two laboratory schools. Informal interview was utilized to gather information on how faculty tends to think about development of critical thinking skills and how these influence their choice of teaching methodologies. Questions also were designed to shed light on the extent to which students are being taught in ways that facilitate skill in critical thinking of students.

The respondents of the study were the second and third year high school students; and their teachers in the Science, English and Mathematics subjects in the two laboratory high schools of CBSUA-Main Campus, SY 2012-2013.

Survey questionnaire was used to determine the classroom techniques used by the teachers, the syllabus/lecture guide/lesson plans were assessed using the Classroom Assessment Techniques (CATs) instrument developed by Angelo and Cross (1993).The survey questionnaire or the instrument for determining the critical thinking skills was adapted from the list of competencies in the revised Bloom's Taxonomy (Anderson, 2001) as well as the Critical Thinking Survey Instrument used by the Students' Outcomes Assessment Committee, Office of Institutional Research of Oakland College (2012). The developed instrument was a breed of these two instruments to determine the level of critical thinking skills of the students.

Documentary review was used in making inventory of the cognitive level used by the teachers. Periodical examination and lesson plan or guides were reviewed to determine the kind of questions prepared by the teacher and the cognitive level of the items in their examination. The results (raw scores) in the third grading examination were requested from the teachers that served as the basis of students' performance.

Class observations were also conducted to determine the oral questioning skills including the cognitive level of questions raised both by the teachers and students. The instrument used is a checklist of the different skills and competencies in the revised Blooms Taxonomy by Anderson (2001).

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The questionnaires for critical thinking skills were distributed personally by the researcher to the students. The retrieval of the questionnaires was also done personally by the researcher. Class observation was done to identify the cognitive level of questions used by the teachers and those raised by the students during class discourse.

The gathered data were then organized and subjected to statistical tests using frequency count and percentage were used to determine the different types of classroom assessments used by teachers, the cognitive level of questions used by the teachers in written and class sessions and the level of questions raised by the students; mean was used to assess the level of critical thinking skill; mean and performance level of the students were used to evaluate the academic performance of the students in Mathematics, Science and English; T-test was computed to determine the significant difference in the level of critical thinking of students by year level between the two laboratory high schools; Kendall Coefficient of Concordance was computed to determine the relationship between the level of critical-thinking skills and the academic performance of the students in Mathematics, Science and English; Chi-Square was used in determining the association of the teacher factors with their questioning skills; and finally Statistical Package for Social Sciences v. 17 (SPSS 17) and Microsoft Excel were used to facilitate statistical computations and data interpretation.

IV. RESULTS AND DISCUSSION

The findings revealed that only 11 out of 50 types of classroom assessment techniques are being used in the two laboratory high schools of CBSUA, namely: CDE-LHS and CDE–CSHB. Except for the use of human tableau or class modeling and application cards in few instances, the other techniques used by the teachers were classified as low-order thinking skills like "remembering" and "understanding". "Applying", "analyzing", "evaluating" and "creating" were rarely used by the teachers. The level of critical thinking of the students in school A was average for both second year and third year students while in school B, low for second year and average for third year. In terms of academic performance, the second year students in school A were average in Math while fair in English and Science; students in school B were fair in Science, English and Math. The third year students in School A were average in English while fair in Math and Science; in school B, the students' performance was fair in three subjects.

There were significant differences in the levels of critical thinking among the second year students in the two LHS along remembering, understanding, analyzing and evaluating while for third year high school students in the two LHS there was significant difference in evaluating but not significantly different with the rest of the levels.

In terms of students' academic performance in Science and "remembering"; English and "evaluating" in school A, there was a significant relationship between the level of critical thinking among students and their academic performance in the three subjects.

The teacher-related factors along gender, marital status, employment status, and number of awards received, were significantly associated with the questioning skills of the teachers. In general, the findings indicated that there were significant association between the student-related factors and the different levels of critical thinking.

V. CONCLUSION AND RECOMMENDATION

The sequential development of critical thinking follows a pattern such as what is provided in the Revised Bloom's Taxonomy. But the researcher gave more emphasis on the development of the high-order thinking skills which basically constitutes the critical thinking skills of the students. The study indicated that, although the development follows a pattern from the low-order to the higher-order, students may possess a higher degree of skills in critical thinking regardless of its order in the hierarchy. For instance, a student may be low in comprehension but may be average or high in application or analysis. This happens when; the different approaches, particularly, in the assessment process were not logically arranged from the lowest to the highest order; and the teacher did not consider balance in the weight or magnitude of items/questions or activities purported to develop the different levels.

Moreover, the development of critical thinking skills requires the development of an effective classroom assessment that is purposely chosen to target the development of certain skills. However, this can only be achieved when the teachers formulate questions both in written and oral along the different levels of critical thinking (including both the low-order and the high order critical thinking). Further, Academic Performance is best measured when the questions are developed along the different levels of critical thinking skills. Otherwise, the level of academic performance will become incoherent to the level of critical thinking skills, thus, the results will become futile to serve as the basis of learner's development.

Another indication that students were able to learn or acquire the critical thinking skills is that they themselves can formulate questions along these different levels. While the critical thinking skills may or may not affect the academic performance depending on how the questions were formulated, the best way that critical thinking can be manifested is through the questioning skills of the students.

Therefore, the key components in the development of critical thinking of students in a classroom setting include: Classroom Assessment Techniques; Questioning Skills of the Teachers, both written and oral; and the Questioning Skills of the Students.

It is hereby recommended that the teachers must be able to maximize the use of other assessment techniques to ensure that the different learning outcomes, particularly the critical-thinking skills are assessed accordingly. They must formulate questions that measure the high order thinking skills to ensure that these skills are assessed and developed among the students.

Teachers must employ varied learning strategies to encourage the students' active participation through asking questions. These include; outdoor practical work activities,

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cooperative learning, computer-aided instruction, manipulative devices, games and other interactive instructions and activities that in turn provoke the curiosity of the students, thus, ask questions during class sessions. They must incorporate questioning into classroom teaching/learning practices, but teachers must ask the right questions. To guide students on the learning process, it is essential to question on learning outcome (content) as well as students' thinking and learning processes. To plan the questions, it is not just the type of questions that is important, but also the timing, sequence and clarity of questions. Answering takes time to think and it is therefore necessary to give students sufficient waiting time before going on to modify the question or asking other students to respond.

Based from the table of specifications gathered together with test paper, the teachers are still using the old taxonomy. They must update themselves, therefore, with the revised Bloom's Taxonomy of objectives so that that the intended skills to be developed among the students are attuned with the international standards and the demands of time.

Those who are in charge of monitoring and evaluation of the schools must include an assessment of the critical thinking skills being integrated in the written examination and class sessions in every subject area, particularly in Science, Math and English.

Since there were significant differences in the level of critical thinking of the students from the two laboratory high schools, teachers and school managers must consider interfacing, sharing of strategies and activities and developing academic programs that will ensure coherence in the curricular offerings of the two high schools, while maintaining the distinct qualities of their respective curriculum.

The school manager and planners must consider integrating the development of critical thinking skills in the curriculum and instruction of the students.

The schools must provide adequate and better preserve training in the art of posing classroom questions, together with in-service training to sharpen teachers' questioning skills, have potential for increasing students' classroom participation and achievement. Increasing wait-time and the incidence of higher cognitive questions, in particular, have considerable promise for improving the effectiveness of classroom instruction.

The findings suggest that educators should approach critical thinking instruction both by integrating critical thinking into regular academic content and, by teaching general critical thinking skills as a stand-alone component. This finding reinforces the importance of providing explicit instruction in critical thinking rather than simply viewing critical thinking as an implicit goal of a course.

Researchers have made several suggestions for designing assessments ideally suited to assess critical thinking skills. First, open-ended problem types may be more appropriate for assessing critical thinking than traditional multiple-choice formats. As Ku (2009) argues, available empirical evidence suggests that open-ended measures better capture the construct of critical thinking because they are more sensitive to the dispositional aspects of critical thinking than are multiple-choice measures. For this reason, Ku recommends using tests of mixed item format, both multiple-choice and open-ended, to more completely represent both the cognitive and dispositional aspects of critical thinking. As Ku (2009) argues, "teachers should adopt different assessment methods, such as exercises that allow students to self-construct answers, assignments that facilitate the practice of strategic use of thinking skills in everyday contexts, and when adopting multiple-choice exercises, follow-up questions should be given to probe students' underlying reasoning.

Teachers must undergo trainings and similar enhancement activities to develop/enhance their art of questioning. It is widely-held that teachers who are able ask thought provoking questions will elicit the students' active participation, particularly those that involved, critical thinking processes. They should be encouraged to continue to pursue professional and personal development through graduate studies, attend retooling and retraining to upgrade competencies so that they could be more creative and innovative, and they themselves will possess the critical thinking skills. There should be a regular evaluation of the performances of teachers with corresponding remediation measures and adoption of appropriate newer approaches. Moreover, since majority of the teachers in the laboratory high school are working under contract of service, the university must consider how this status might affect their delivery of their duties and responsibilities which in turn could affect the learning outcomes of the students and the institution as well.

Further researches may be conducted using other variables and dimensions of learning which can be considered as factors related to the academic performance and development of critical thinking skills of the students, as well as the teachers.

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