Analysis Of The Proficiency Skills Of B.S. Computer Science Students In Cabanatuan City, Philippines: A Basis For Policy Formulation

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Abstract: The main purpose of this study is to provide a framework for enriching the existing Bachelor of Science in Computer Science (BSCS) curriculum out of the results of the proficiency tests administered to student-respondents in four higher education institutions (HEIs) in Cabanatuan City and the feedback from the industry sector partners in Nueva Ecija regarding the Information Technology (IT) skills needed in the workplace. Two major areas of computer science, computer programming and system analysis and design (SAD), were utilized as the focal point of the study. A descriptive survey method was used using two sets of questionnaires with their respective scoring rubrics and an employer survey form. Sixty-five senior students taking BSCS from different HEIs in Cabanatuan City constituted the respondents. Feedback regarding the technical IT proficiency skills needed in the workplace was also solicited from forty-four industry sector partners in Cabanatuan City, Nueva Ecija, Philippines. Industry sector partners perceived the following technical IT skills needed in the workplace: fundamental computer skills; administering computer networks; troubleshooting and maintaining hardware and software; and writing, administering, and implementing computer-based solutions. Least important skills were recognizing technical interoperability; conducting research in computer-related area; and performing other technical computer-related skills such as creating design using AutoCAD, and setting up and producing computer-generated accounting reports and the likes.

Index Terms: Bachelor of Science in Computer Science (BSCS), computer programming, proficiency skills, systems analysis and design (SAD)

1 INTRODUCTION

Educators are increasingly acknowledging that practical problems in computer science demand basic competencies in experimentation and data analysis. However, little effort has been made towards explicitly identifying those empirical concepts and skills needed by computer scientists, nor in developing methods of integrating those concepts and skills into Computer Science curricula. The policies and standard for Information Technology Education as stipulated in CHED Memorandum Order (CMO) Number 53, series of 2006 [1] enlightened the researcher in the competency skills needed to prepare students to become IT professionals by the time they graduate. Specifically, this CMO stated that “…Information Technology is ever dynamic; its advancement and development has been rapid and its evolution is a continuous process. To face the challenges of advancement, the Commission recognizes the need to be responsive according to the current needs of the country. Hence, it is essential and important that the country’s IT capability should be continually developed and strengthened to be at par globally”. To achieve this, all private and local colleges and universities intending to offer degree programs in Computer Science, Information Technology, and Information Systems must first secure proper authority from the Commission on Higher Education in accordance with the existing rules and regulations. The degree for BSCS prepares students to be IT professionals and researchers, and to be proficient in designing and developing computing solutions. This program includes the study of concepts and theories, algorithmic foundations, implementation and application of information and computing solutions.

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After satisfactorily completing all the requirements leading to this degree, graduates may qualify but not limited to the following entry level positions:

- Application Developer;
- Computer Science Instructor;
- Database Programmer/Designer;
- Information Security Engineer;
- Quality Assurance Engineer;
- Researcher;
- System Developer; and
- System Analyst.

Article IV of the same memorandum states the expected competencies or competency standards that the graduates of BSCS, BSIT, or BSIS programs must acquire after graduation. Competency, in this article, refers to specific skills, knowledge and attitude that may be demonstrated through performance, while standards are common set of expectations [2]. For this reason, the researcher endeavor to give proficiency test to senior Computer Science students using the prototype of the ICT proficiency exam questions from the National Computer Center (NCC) [3] and the Civil Service Commission (CSC) [4]. The NCC is an agency whose primary task is to administer proficiency test to graduates and senior students of IT program in the areas of computer programming and system analysis and design (SAD) in pursuant to Presidential Decree 1408 which directs them to devise ways of determining the fitness of individuals in occupying highly technical ICT positions here and in abroad [5]. The CSC on the other hand is a government agency in-charge in issuing certificate of eligibility to successful examinees of the ICT Proficiency Test [6].

Specifically, this research attempted to find answers to the following questions:
1. How may the students’ proficiency skills along the areas of computer programming and system analysis and designed be described?
2. How do the ratings on the proficiency skills of students
3. How may the feedbacks from the industry partners on proficiency skills of students be described?

4. What areas in the Computer Science curriculum need enrichment?

II METHODOLOGY

This study which made use of the descriptive method of research involved 34 senior Computer Science students from different HEIs in Cabanatuan City and 44 industry partners taken by complete enumeration and purposive techniques, respectively. The primary data-gathering instrument used was the questionnaire which consisted of two sets – a set for the computer programming area and another for systems analysis and design area. The set for computer programming attempted to collect data regarding the proficiency skills of students in basic computer concepts, programming languages, stages of programming, file access method, internet and e-commerce, and computer networking. The questionnaire for systems analysis and design dealt with the student’s proficiency skills in preliminary investigation, systems analysis, systems design, systems development, systems implementation, and systems maintenance. The researcher gathered the student-respondents in their respective School’s computer laboratory room and distributed copies of the questionnaires. This was also done to explain to them the contents of the proficiency test. The written test in computer programming and system analysis and design were first administered to the students. After the written tests, the researcher also spent time explaining to them the contents of the computer programming scoring rubric before the administration of the actual test. This was followed by the performance test in system analysis and design. Using the employer survey form, the researcher also endeavored to conduct informal interviews with some 44 industry experts especially those whom she knew, as a means of getting feedbacks regarding the technical IT proficiency skills of the Computer Science students. The statistical tools used for analyzing the data were descriptive statistics such as frequencies, percentages, rank, weighted mean, and one-way analysis of variance (ANOVA) with Scheffe’ contrast test. All analyzes were performed using the Statistical Package for Science (SPSS) and the Analyze-it for Excel programs.

III RESULTS AND DISCUSSION

1. As to proficiency skills of students in computer programming and systems analysis and design

The test scores of students in the internet and basic computer concepts/sub-areas were satisfactory; scores were not too high, nor too low. But they got low scores in the following sub-areas: programming languages, stages of programming, file access method. A very low mean score was also computed from the scores of the students in computer networking concept. Likewise, low scores in the actual test in C or C++ computer programming test were also noted. As a whole, the computed mean scores in the written and actual proficiency tests for computer programming were low. Moreover, when these scores are combined together, total mean score is still below, 70 points, the passing mark set by the Civil Service Commission on the ICT proficiency test for computer programming. Therefore, if passing this test is aimed for, serious considerations should be given to sub-areas/concepts with low and very low mean scores. In general, the computed mean scores in the written and actual proficiency tests for systems analysis and design were also below the passing mark set by the Civil Service Commission; sub-areas with very low scores are as follows: systems analysis, systems implementation, and systems maintenance; low scores were also noted in the following concepts: preliminary investigation, systems design, and systems maintenance. Moreover, the results of the actual test in systems analysis and design were also low. These findings suggest that student-respondents should focus attention on studying the processes or stages of systems analysis and design since problems in the basic skills and learning of the topics included in this area is not the only concern of the school. The performance in this area has a direct bearing on their ability to learn other major areas in the Computer Science curriculum. When these problems are not being settled, passing the proficiency test in systems analysis and design will be hard for the students. There are significant differences in the proficiency skills of students from School A, School B, School C, and School D in the two areas under survey, namely: computer programming and systems analysis and design. As regards computer programming, the findings in the written test indicate that test scores of students from School C are higher than the test scores obtained by the students from the three other schools, School A, School B, and School D. Likewise, test scores of School A were higher than test scores of students from School D. Moreover, in the actual test in computer programming, students from School C also obtained high scores than those students from School A, School B, and School D. As a whole, when the performances of these groups of students in the written and actual tests are ranked, School C is on top, followed by School A, School B, and School D, respectively. These findings indicate the need for these computer schools to plan and implement activities which will enhance the proficiency of students in the said area. With regard to the results of the written test in systems analysis and design, test scores of students from School A are higher than the scores obtained by the students from the three other groups of respondents, School B, School C, and School D. However, results in the actual test of students in systems analysis and design show that School C students are on top of the list; second rank was occupied by the students from School B followed by students from Schools A and D, respectively. These findings suggest that school administrators and IT teachers as well should seek suggestions and recommendations from some computer experts and consultants to improve instruction in particular, and the computer science curriculum in general.

2. As to proficiency skills of students in computer programming and systems analysis and design

In general, when the test scores in the written and actual/practical tests in systems analysis and design are compared, data shows that School A ranked first, followed by School C, School B, and School D, respectively. For the computer science students to meet certain level of proficiency in computer programming and in systems analysis and design, the school administrators should come-up with a workable plan to improve students’ performance in these areas. The school administrators could: (1) strengthen linkages with industry partners to insure that senior students/student-trainees are trained properly and that they are given chances to enhance their technical abilities...
which will prepare them for future employment in the field of IT; (2) allocate budget for improving the hardware and software facilities and equipment in the computer and internet laboratories to improve instruction; (3) if possible, solicit donations/financial assistance from successful alumni to improve the school facilities and to provide students with regular access to well-equipped computer laboratories and networks, since laboratory work is an essential component of the curriculum; and (4) embark on cross-institutional complementation program particularly on instructional resources so that small schools who cannot afford to purchase/put up good learning resources (printed and non-printed materials) can be helped by those schools that have adequate library materials or facilities.

3. The results of the employer survey shows that among the 9 identified technical IT proficiency skills, the fundamental/basic computer concepts was recognized by the industry partners as the most important followed by the proficiency skills in computer networking and computer programming or systems development. On the other hand, the skills in conducting research on computer-related areas were the least important technical skills since these skills are needed by only few of the industry partners. Aside from the above-mentioned technical IT skills, industry partners are also recruiting and hiring flexible employees who can perform other technical skills like doing basic accounting or simple engineering tasks. The government, represented by the CHED and DOLE officials, should come-up with some schemes on how to narrow the gap on technical IT proficiency skills of the students vis-à-vis the needs of the workplace because the wider the gap is, the more hazardous it become to the schools and to the IT students of these schools, and so with the employers of these students. Among the schemes that maybe adopted are as follows: a kind of memorandum of agreement between the schools (sending institution) and the industry partners (employer); and increased financial and scholarship assistance for computer science students and instructors.

4. If the ICT proficiency skills and employability of Computer Science students/graduates in computer programming and systems analysis and design are aimed for, all sub-areas with low scores should be given serious considerations. These sub-areas are as follows:

For computer programming area:
- programming languages;
- file access method;
- stages of program development; and
- computer networking.

For systems analysis and design area:
- systems analysis;
- systems design;
- systems development;
- systems implementation; and
- systems maintenance.

The proficiency skills of students in sub-areas with satisfactory scores should be maintained and improved to the next higher level. These sub-areas are: internet and basic computer for computer programming area; and preliminary investigation for systems analysis and design area. The school administrators/owners should push all their IT instructors to climb up the educational ladder by taking up graduate programs in Information Technology or Computer Science to insure the quality of information technology and computer science education in the tertiary level. This could be done by means of some incentives in the form of scholarship for deserving faculty members, loans for those financially handicapped and in the form of promotion in position and salaries. Aside from upgrading the competencies of Computer Science instructors through graduate education and continuing professional education, a balance of full-time and part-time faculty should complement the improvement of the academic curriculum.

IV. CONCLUSION
To encourage private and public school offering Computer Science program to improve on all facets in IT education, the government through the CHED should provide more benefits to accredited IT schools in addition to the ones already provided like giving them financial assistance for continuous improvement of school facilities, equipment and teachers, publishing them in local or national newspaper and the like. In this way, those schools that lag behind will be pushed to move up in order to avail of the same benefits. The CHED Regional Office should see to it that its guidelines and standards, as stipulated in CHED Memorandum Order for Information Technology Education, are implemented the way they should be by fielding a monitoring team on a regular basis. The instructors should improve their educational qualifications by enrolling IT-related graduate school program and attending seminars, workshops, benchmarking, peer observation, educational meeting and conferences and the like. For students to master major computer subjects, IT instructors must acquire both a mastery subject matter and the pedagogical skills that will allow them to present the material to students at appropriate levels. It is understood that there is a match between the computer science skills and knowledge defined for the students and the acquired skills and knowledge of the instructors. At the same time, teachers must have a greater depth of knowledge than that embodied in the topics they are teaching. Teachers must be transformed from ‘information delivery specialist’ into guides and facilitators of learning. The Computer Science students/graduates should improve their skills by attending seminars, workshops, skills fora and the like. They should keep themselves abreast of current developments and continue with long-term professional growth. Professional organizations in computer science and information technology should establish consortium arrangements with Higher Education Institutions in the city or in the region for the conduct of specialized training programs in IT. Industry partners should be willing to give feedbacks to the HEIs regarding the technical proficiency skills needed in the workplace so that students can be trained in accordance with these skills. Industry partners who are getting student-trainees should be aware of the technical competencies that are supposed to be developed among students during the on-the-job training. As much as possible, student-trainees must be assigned to areas/departments where their skills in computer can be fully-utilized and improved. Trainees work should not be limited to data encoding, filing, and other secretarial duties. Comparative studies on the technical proficiency skills of IT students from public and private tertiary schools are strongly recommended.
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REFERENCES