RELEVANCE OF UNDERGRADUATE PHYSICS PROGRAM AND THE MATCHING OF EMPLOYMENT NEEDS AND LEARNING OF EMPLOYABILITY SKILLS: A PHYSICS ALUMNI SURVEY OF THE UNIVERSITY OF SAN CARLOS

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ABSTRACT

This paper reports part of an evaluation study on the BS Applied Physics of the University of San Carlos. It focused on investigating the relevance of the program to the employment needs of the graduates and the matching between the extent generic skills were learned and the extent these skills were needed in the workplace. Using a mix method design, data were collected through survey questionnaire from 59 alumni-respondents and semi-structured interviews of 6 employers. The results indicated diverse degree of program relevance; highly relevant to alumni in the manufacturing industry while moderately relevant to the majority who were employed in Business Process Outsourcing (BPO) and software industry. In matching generic skills need and skills learned, significant differences were observed on some skills, abilities, and attributes. Implications on the development of these within the BS Applied Physics Curriculum were drawn and recommendations to bridge the gap were made.

Keywords: BS Applied Physics, program relevance, employment need, skills match, skills learned, generic kills, skills gap, Physics career

1. INTRODUCTION

In recent years, there is an increasing demand on accountability in higher education institutions to offer relevant degree programs that meet the needs of the rapidly changing global society. Jacobs (2010) contends the need to overhaul, update, and inject life into curricular programs to prepare learners for the world and their future. Along this line, curriculum evaluation is essential as it sheds light on how academic programs fare outside of school-life, providing a good picture of the program's "state-of-affairs." A comprehensive evaluation including opinions from alumni and their current and potential employers may indicate inadequately covered areas, or skills graduates are lacking, gauge departmental strengths; consequently allows departments to establish a means to meet observed deficiencies (Madewell, Savin, & Brye, 2003)

Physics as a discipline is recognized as a cornerstone in the realm of industrialization and information technology (National Science Foundation, 2005). It is important in terms of supporting traditional industries where scientific advance has increases reliance on technology and physics-based research (Sharma, Pollard, Mendez, Mills, O'Byrne, Scott ….Zealey, 2008). Physics graduates are expected to be capable of contributing to these needs. But, while they may have higher level of technical skills, the findings of Sharma, et al. (2008), reveal that they have deficiency of soft skills or generic skills or employability skills. Their study used interviews of alumni in the past five years, as well as employers to figure out the graduates' strengths and weaknesses.

In the Philippines, the University of San Carlos (USC) Physics Department offers a 5-year BS Applied Physics program since in the early 2000 when the Department collaborated with the Free University of Amsterdam in an eight –year project. This project provided the Department the financial assistance to upgrade its resources and facilities, to improve the teaching competence and research capabilities of the faculty, and to enhance the quality of the academic programs, both the professional and service programs. One major outcome was the revision of the traditional 4-year BS Physics program into a 5 -year BS Applied Physics with specialized field. The impetus for revision primarily rest on widening the graduates' job opportunities, which according to the Dutch consultant Dr. Gerrit Kuik, was previously limited to high school and college teaching. With the 5-year program, students can be accorded better training and foundation for various employment and graduate studies. Kuik further noted that *"by introducing experiences that would provide students good training in physics concepts, analyzing problems, giving solution to problems and developing experimental skills and research skills, students can be better prepared for employment."*

This 5-year BS Applied Physics program became one of the priority curricular programs under the Department of Science and Technology Undergraduate Scholarship programs implemented by the Science Education Institute (DOST-SEI). However, since its first implementation in AY 2002-2003, there was no evaluation on the extent of relevance of the program to the alumni's careers. Moreover, the results of evaluation can drive revisions and improvements of some parts of the program or of the entire program. The most important purpose of evaluation, after all, according to Egon Guba, as cited by Stufflebeam and Shinkfield (2007), is not to prove, but to improve. Thus, in line with the USC's Mission statement to develop transformative and relevant programs that are responsive to the needs of society and the global community, a research-based curriculum evaluation is imperative for continuous program improvement.

1.1 Importance of Alumni and Employer Survey

Any academic program requires continuous curriculum evaluation to address changes in the needs of society, development in technology, and accountability (Grecho, 2008). The goal is to influence decision-making providing empirically driven feedback. Feedback information can be sourced directly from curriculum participants, faculty and students, and from secondary sources not directly connected with the program like curriculum experts, parents, content experts, and employers (Madewell, et al., 2003).

Evaluation through alumni surveys is significant because these are designed to extract alumni's reflections on the quality of their educational experiences that are strengthened by their experiences since graduation (Moden & Williford, 1988). On the other hand, employer survey provides information whether the existing curriculum has developed in them the knowledge and skills required in the workplace (Madewell, et al., 2003). In many parts of the world, alumni and employer surveys were conducted for Physics programs; in the United States (Ivie & Stowie, 2002), United Kingdom (Hanson & Overton, 2010), Australia (Sharma, et al., 2008), and Malaysia (Shin & Fatin, 2012). The purpose was commonly to identify areas of the physics curriculum that were useful for the graduates in the workplace.

In the Philippines, curriculum evaluation for Physics programs is not prevalent, primarily because there are few universities offering undergraduate programs; only 18 out of over 2000 higher education institutions (Saloma, 2008). Furthermore, Physics enrollment is low with only 0.05 percent of the total number of students enrolled in Physics for SY 2003-2004 (Saloma, 2008). But this reality does not deter any Physics Department to conduct regular curriculum evaluation.

1.2 Generic Employability Skills

Whilst the desired outcome of a B.S. Physics graduate is to finish doctoral program, conduct research, and publish works in reputable journals; oftentimes, the next step after graduation is to find a job. But until recently there are several studies revealing the disconnection between higher education systems and the needs of 21st century employers, both public and private (Playfoot & Hall, 2009; Hooker, 1997). One primary reason of the disconnection is the disparity between college graduates' skills and the skills needed for employment (Shin & Fatin, 2012). Several studies disclosed that a large proportion of the graduates may have higher level of hard knowledge and skills but have lower level of soft skills which are essentially useful for current jobs (Sharma, et al, 2008; Shah & Nair, 2011). This revelation does not exempt Physics education (Hanson & Overton, 2010; Shin & Fatin, 2012).

Fallows and Steven (2000) posited that the economic situation today means that it is no longer sufficient for a new graduate to have knowledge of an academic subject. It is necessary for students to gain soft skills which will enhance their prospects of employment. Soft skills are important because jobs today require flexibility, initiative, and the ability to undertake many different tasks. Jobs today are more service oriented, making information and social skills increasingly important (Greatbatch & Lewis, 2007). For instance, the studies of Ivie and Stowie (2002) in the United States; Hanson and Overton (2010) in the United Kingdom; Sharma, et.al (2008) in Australia; Shin and Fatin (2012) in Malaysia and Jagger, Davis, Lain, Sinclair, and Sinclair (2001) revealed that Physics graduates ranked high on problem solving skills, but the generic skills of communication and teamwork were often not well developed within the program. Because of the apparent generic

skills gap between the alumni's employment needs and what their education provide, alumni have diverse levels of satisfaction with various aspects of their education (Martin, Milne-Home, Barrett, Spalding, & Jones, 2000). Evidently, they seek more from their college experience (Delaney, 2004). Broadly speaking industry representatives are satisfied with the technical or discipline-specific skills of graduates, but for some there is a perception that employability skills are under-developed. Some employers believe that universities are providing students with a strong knowledge base but without the ability to intelligently apply that knowledge in the work setting (Cleary, Flynn, & Thomasson, 2006).

In Australia, an Employability Skills Framework was founded as a result of a collaborative project of the Australian higher education providers, business, industry, and communities (Cleary, et al. ,2006). The framework includes eight skills and personal attributes that contribute to the employability of a graduate. The skills include communication, teamwork, problem solving, self-management, planning and organizing, technology, life-long learning, and initiative and enterprise. The accompanying attributes encompass loyalty, commitment, honesty and integrity, enthusiasm, reliability, personal presentation, common sense, positive self-esteem, sense of humour, balanced attitude to work and home life, ability to deal with pressure, motivation, and adaptability (Curtin, 2004). In the United Kingdom, Europe, Australia and North America, the generic skills, according to Greatbatch and Lewis (2007) are classified into (a) fundamental skills such as literacy, using numbers, and technology skills; (b) people-related skills such as communication skills, interpersonal skills, influencing skills, negotiation skills, team working skills, customer service skills, and leadership skills; (c) Conceptualising or thinking skills such as managing information, problem solving, planning and organizing skills, learning skills, thinking innovatively and creatively, reflective skills; and (d) personal skills and attributes such as being enthusiastic, adaptable, motivated, reliable, responsible, honest, resourceful, committed, loyal, flexible, well presented, sensible, able to manage own time and deal with pressure; (e) skills related to the business world such as innovation skills, enterprise skills, commercial awareness, business awareness and (f) skills related to the community such as citizenship skills.

Meanwhile, in Southeast Asia, Chalamwong, Hongprayoon, and Suebnusorn(2012) report that the most demanded soft skills in Thailand are analytical skill, management skill, technical skill and teamwork skill, computer skills and language skill. In Cambodia, important life skills are work attitude; teamwork, critical thinking, and problem-solving skills apart from technical skills are highly demanded. But young Cambodians lack these skills. In Vietnam, formal education emphasized only on some skills such as information skills, negotiation skills, understanding of system, and ability to apply technology to assigned tasks. On the average, several areas of improvement are still observed in terms of time and human resource management, teamwork skill, ability to teach new skills to others, to exercise leadership, to improve and design system, and to select technology. Thus, some employers relate that they are not totally satisfied with the average college graduate (Koehn, 1995).

Based on empirical evidences and using the particular case of the BS Applied Physics, this study aimed to determine, from survey responses, the perceptions of alumni and employers on the following issues:

1) The degree of relevance of the BS Applied Physics program to the alumni's careers
2) The matching of the extent development or learning and the extent of employment needs of the generic employability skills.

2. RESEARCH METHODOLOGY

Using a mix method design, data were collected through a survey questionnaire from alumni respondents and more in-depth qualitative data were collected from interview with employers of the alumni. In the first phase, alumni's self- assessment was collected as to the extent of relevance of the Physics program contents to their respective careers. Also collected was their perceptions of the degree of employment needs and degree of academic learning of generic skills. In the second phase, employers' opinions were sought regarding skills set that alumni-employees or any employee, in general, ought to possess to be effective and efficient in their companies.

2.1 Survey Respondents

The survey focused on the alumni from 2007 up to 2011 cohorts. They were traced through email addresses, mobile, and social networking sites. Out of 70 alumni within the specified period , 59 (84.27%) responded to this study. They were asked to name their employers to be approached for a semi-structured interview. But only 6 employers participated. They represent Business Processing Outsourcing (BPO) industry, software industry, semiconductor industry, and thin film optical filters industry.

2.2 Research Instrument

An alumni survey questionnaire was used as the major data collection tool. The questionnaire consists of 5 sections. Section 1 contained items on the respondents' demographic information. Sections 2, 3 and 4 required responses on a five point Likert scale on the respondents' perception on the extent of learning or development of the generic skills, abilities and attributes within the Physics program and matching the extent of need of these generic skills, abilities and attributes on their employment or careers, their degree of satisfaction of their learning experiences within the program, and their evaluation on the degree of availability and accessibility of the facilities and resources. Section 5 elicited the respondents' opinion on some aspects of the program and Section 6 required check box responses on their employment status. In particular, the range of Likert ratings matching employment needs and academic learning in Section 2 where from 1 representing "Not Needed" and "No Learning" to 5 representing "Extremely Needed" and "Excellent Learning."

The inventory of 15 generic skills, abilities, and attributes were sourced from literatures (Ivie & Stowie, 2002; Hanson & Overton, 2010; Sharma, et al., 2008; Shin & Fatin' 2012; Cleary et al., 2007; Curtin, 2004; Greatbatch & Lewis, 2007) and from inputs of the USC Physics teaching faculty and Education professionals and alumni. The survey instrument initially pretested and piloted for validity and reliability. It was reliable with Cronbach alpha 0f 0.91.

2.3 Treatment of Data

Quantitative data generated from the responses in fixed-choice Likert-scale surveys. Descriptive statistics including frequency distribution tables, graphical displays and measures of averages and dispersion were used to organize the data and describe average or typical response. On the other hand, the standard deviation was used as a measure of variability to provide an idea of how the scores were dispersed or spread around the mean. Then a paired –samples t-test was conducted to compare the alumni's evaluation on the extent of academic learning of the generic skills, abilities

and attributes in the program and their perceived degree of need of these skills, abilities and attributes in their employment

3. RESULTS

Of the 59 alumni respondents, 42 (71.2%) signified being employed within 3 months after graduation, 6 (10.1%) employed within 6 months, and another 6 (10.1%) employed after 6 months. The job profile of the respondent is shown in Table 1.

Table 1. Job Profile of BS Applied Physics Alumni (page 123)

Most of the alumni were working in the business process outsourcing (BPO), comprising 33.8 % of the total number of respondents, and software industry at 18.6 %. These two jobs have attracted majority of the alumni –respondents. A few are teaching and working in a couple of manufacturing industries and in a retail business store. One respondent is a management trainee of a bank and another one was pursuing medicine.

In the survey, the respondents who work in BPO industry claimed to have varied tasks, all of which are geared towards serving international clients. These tasks include interacting with clients via phone, conducting audit analysis, and act as Project Management Office (PMO). PMO prepares reports and provide assistance on business rules. To a certain degree, they also troubleshoot internet connection and other networking problems. On the other hand, the alumni employed in the software or IT-related industry are programmers. Some are junior programmers and some are already senior programmers. Their job descriptions differ in nature depending on which company they are working with. For instance one alumna worked as a firmware Engineer and her function is to design an embedding system or firmwarer for the company‘s high-end laser printer. Another respondent is a team leader who leads the Java J2EE Department of a web-designer company. Some respondents are tasked to do basic audio and image editing, and some serve as software maintenance expert.

Next to BPO and software industries, the alumni are hired in retail business company, educational institutions and manufacturing industries. For the business retail company, the monitor inventory and sales, analyze inventory risks, perform studies related to supply chain, and select and purchase merchandise to fit the market in each retail outlet.

3.1 Relevance of the Program on Alumni’s Employment

To gain insight into the extent of the relevance of the program to the alumni, the alumni respondents were asked to rate their degree of disagreement- agreement in a scale of 1 (strongly disagree) to 5 (strongly agree) on the relevance of the program contents to their current employment or careers. The results revealed that, on the average, the alumni agree to some extent that the Physics program contents were relevant to their employment and careers with a mean rating of 3.13 ± 1.19. The standard deviation (SD) of 1.19 indicates higher degree of variation in alumni’s responses. Regarding specific jobs, the program was perceived as highly relevant to seven alumni, representing 11.9% of the total respondents, who are teaching high school and college Physics; seven alumni working in manufacturing industry (11.9 %), and 4 alumni (6.8 %) enrolled in

graduate Physics program. On the other hand, the program was deemed somewhat relevant to 19 alumni (32.2 %) in the BPO industry, 11 alumni (18.6 %) in the software industry; and 6 alumni (10.2%) in a retail business company.

3.2 Matching Alumni's Assessment of the Degree of Learning with the Degree of Employment Needs of Generic Skills, Abilities and Attributes

In view of the goal of the program, self-assessment data from the alumni were collected regarding the extent employment needs and learning of generic skills, abilities, and attribute. Further, the extent of employment need - learning match of the skill set is analyzed. The range of ratings matching employment needs and academic learning were from 1 – not needed (no learning) to 5 – extremely needed (excellent learning). The mean scores are shown in Table 2 and Table 3.

The result imply that the respondents have good learning to excellent learning the of the listed skills, abilities, and attributes within the program. Mean scores range from M= 3.52 for leadership skill to M= 4.48 for critical thinking skill. In terms of employment need, ratings were relatively higher, from M= 3.78 (sufficiently needed) for computer skills to M=4.87 (extremely needed) for ability to perform quality work. Two-sample paired t-tests were run for paired samples of data matching the mean scores of alumni perceptions on the extent they learned the skills and the extent they need these skills in their employment. The results revealed there were no significant differences between the alumni's extent of employment need and extent of learning of seven skills ($t = -2.92$ to 2.15; $df = 54$; $p > 0.05$) as summarized in Table 2 . These skills labelled as Cluster A skill set are skills which employment need (N) ratings matched well with the university learning (L) ratings..

Table 2. Respondents' Assessment of Employment Need and Learning (Cluster A Generic Skills, Abilities) (page 123)

Critical thinking, analytical skills, independent learning and written communication are all extremely needed in the jobs and well- learned in the university. On the other hand, problem solving, oral communication and computer skill are sufficiently needed and the respondents have equally good learning on these skills.

The second cluster of skills, Cluster B, is composed of eight skills and attributes as shown in Table 3. Significant differences were observed between the alumni's perceived extent of employment needs and their perceived extent of university learning ($t = -6.74$ to 7.61; $df = 54$; $p < 0.05$). The difference (N – L) is observed to be positive, indicating gaps in all skills and abilities.

Table 3. Respondents' Assessment of Learning and Employment Need (Cluster B Skills and Abilities) (page 124)

Cluster B skill set was found to be extremely needed in the workplace, from M= 4.33 for leadership skill to M= 4.87 for ability to perform quality work or product. Each item in Cluster B are perceived to be almost equally important at the highest level. But the extent of learning did not match with the extent of employment need. Learning scores were obviously lower than the employment need scores. The greatest gaps were evident in leadership skill, followed closely with the ability to perform quality work/product and time management skill. Although these skills were

not totally underdeveloped since the respondents perceived their extent of learning in these areas as good learning (M= 3.40 -4.19) to excellent learning (M= 4.20 to 5.00), but significant gap was observed depicting lack of congruence between development of the skills and career needs.

3.3 Employers' Perception of Relevant Skills

Even with a relatively small number of responses from 6 employers, their views matched with the responses of the alumni. In terms of extent of skills requirement in their company, all employers preferred high level of skills in critical thinking, independent learning, teamwork, and computer. They would also like to have employees who are creative, and innovative. Two employers of manufacturing industries expressed that they would be more pleased to have employees who possessed high levels of both technical and generic skills although they know from their own experience, this is too ideal. For now their requirement is a promising employee with potential to be flexible and trainable. Put simply by one employer : "We don't hire people because of what they can offer but we hire them for their potential"

It is interesting to learn that the employers' responses on the needed skills in the workplace matched with the alumni responses. The skills they highly regarded were the same skills found in Table 2 and 3, Cluster A and B skills and abilities. All six employers claimed that if these skills and abilities can be further developed in the students' college education, then they can be better prepared in the workplace.

4. DISCUSSION

The result suggests that among the jobs of the alumni, the most relevant to their university education were teaching and employment in the manufacturing industry. The relevance of formal education to the rest of the of alumni's jobs is not highly evident. This study shows that the extent of relevance greatly depends on the nature of jobs of the alumni. It was clear the alumni took advantage of the BPO and software boom in the country. While the program was conceived to prepare the graduates for employment in the manufacturing industries as expressed by G. Kuik, the results of the survey showed that only a few alumni settle in this type of industry. The greatest percentage of the alumni ended up in the BPO industry.

The redirection of employment opportunities is understood in the light of the rapidly changing employment structure in the Philippines over the past ten years. The BPO industry and the software industry have overtaken the manufacturing industries in terms of generating jobs. This emerging change in the employment landscape in the Philippines is elucidated in an Asian Development Bank report (Magtibay-Ramos, Estrada, & Felipe, 2008). The BPO sector was estimated to contribute to only 0.075% of the economy‘s gross domestic product (GDP) in 2000. Yet in 2005, this contribution leaped to 2.4%. In year 2011, BPO Philippines Chairman Alfredo Ayala claimed the industry‘s overall contribution is estimated at 5.4 percent of the GDP, a big surge since 2005 (Agcaoile, Oct. 10, 2012). Further, in the same newspaper, DOST Secretary Mario Montejo expressed optimism that BPO sector can meet its target of contributing about 8.6 percent to the Philippines‘s gross domestic product (GDP) by 2016. Moreover, Aldaba (2014) claimed the weak performance of the Philippine manufacturing industry. This reality established the reason on how alumni end up yet flourish in the BPO industry.

The economic trend and the redirection of employment have propelled the need to enhance generic skills development. Cluster A skills in Table 2, which include critical thinking, communication, and computer skills were developed well in the university. The good development has shown to satisfactorily provided the respondents with a good preparation for employment. Cluster A skills are considered the alumni's key to employment in wide-range of jobs, providing them the flexibility and intellectual agility. This result runs parallel to the study of Ivie and Stowie (2002). In point of fact, Physics graduates are not trained for BPO and software jobs, but their ability to think and analyze situational or technical problems have groomed them in addressing the economic and technological changes of society. One respondent of Batch 2010 who work as Research and Development said "*Physics has taught me a great deal about problem-solving, logical and systematic thinking. Having a few basic computer training made the transition from college to my current employment smooth."*

On the other hand, the gaps observed in Cluster B skills can also be called as "perception gap" or "employability gap" (Crebert, Bates, Bell, Patrick & Cragnolini, 2004). The marked reason behind the term employability gap is that these sets of skills are highly required in the workplace and at an equal pace with Cluster A skills. Thus, both clusters are branded as the employability generic skills. Cluster B areas though are evidently less emphasized in the Physics curriculum as compared to Cluster A areas. But pattern of perceived gap was likewise established in several studies (Hanson & Overton, 2010; Sharma, et al., 2008; Shin & Fatin, 2012). This recent study recognized that the problem lies on the fact that these skills are not tenaciously embedded in university curriculum.

Since the nature of the respondents' employment is service –oriented, there is a greater demand for leadership and teamwork skills, including ability to learn new skills and ability to cope with pressure due to project deadlines. Being responsible and conscious of professional ethics are equally important. One respondent expressed that their superiors and foreign clients are very demanding, time conscious, and meticulous on quality of performance. Thus, Cluster B skills are essential and must be developed at par with Cluster A skills.

In the specific case of teamwork skill, this has become significant because according to Stevens and Campion (1994), such skill has become an extremely popular work design in all types of organizations. The great enthusiasm for work configuration using teams might be considered a fad in modern management philosophies. A team requires a lead. Thus, with Stevens and Campion's contention and the actual work setting today, teamwork skill and leadership skills and other closely related skills and abilities under Cluster B, were therefore deemed relevant to the respondents.

5. CONCLUSION AND RECOMMENDATION

Overall, from the perspective of the alumni-respondents, the undergraduate Applied Physics program was relevant to their present career. Their perception on the extent of relevance of their undergraduate program varied relative to the context of their current employment. The program was perceived as highly relevant, particularly to the manufacturing industry like the semiconductor and optical filters industry and teaching while moderately relevant to the BPO and software industry. The changes in the economic and employment landscape of the country are characterized by increasing dominance of outsourcing services and information technology. The natures of these jobs require workforce flexibility, ingenuity, and the ability to carry out different tasks. Thus, there is need to rethink on how the physics program can be made more relevant in response to the changing employment structure in Cebu and in the Philippines, and to the global demands and

trends on employment. Physics program should be aligned with employer needs by developing not only the hard skills but also the employability skills needed in the workplace.

Advance level of employability skills and abilities add worth to employees' hard skills, providing them the edge over competitors (Seetha, 2013). However, Talisayon (2008) admits that the teaching of Physics courses is more focused on Physics concepts & their relationships and laboratory skills development rather than on employability skills and values development, which are clearly more important in the current labor market and in life. Undoubtedly, Physics graduates, even with employability skills deficiencies are hirable because of their attributes of being flexible and trainable, but the Physics Department must not rely on these attributes. It has to start employing varied teaching strategies that would exacerbate employability skills development at an even pace with Physics skills development.

Embedding the training of the generic skills into hard skills is very effective and efficient method in the equal development of both set of skills (Shah and Chenicheri, 2011). This can be achieved by both the teaching Physics while enhancing the development of generic skills through proper delivery methods. Thus, the teaching faculty must restructure the methods of delivery and student assessment. Generic skills should be explicit rather than implicit so the students know that they are taught and assessed with the skills. Among the effective teaching methods for employability skills training in the classroom are the various interactive learning instructional strategies. The common element in these learning strategies is to keep students active and participative. Eison (2010) contends that these strategies allow students to think critically, talks with teammates, express opinions orally or in writing, explore values and attitudes, give and receive feedback, and reflect upon learning process. The focus then is learning by doing and by experiencing. Over time when the active learning methods have been consistently implemented, extended from semi structured to more structured approach, students will learned, develop, and internalize the skills. Seetha (2010) pinpointed that internalization ensures that the skills and attributes become part of the students' nature and quality

Implementing peer discussion or peer instructions as a teaching method enhance teamwork skills. Crebert, et al.(2004) posits that teamwork be provided higher emphasis. Teaching students how to work collaboratively in a well-designed structured process is crucial because it can co- develop other associated employability skills. But not to be disregarded are the academic staff. The teaching staff must be confident in administering interactive learning strategies which target both the technical skills and employability skills development. Faculty support, development, and training are essential opportunities for them to develop more confidence and expertise in the use and implementation of interactive teaching-learning strategies.

Finally, this study shows the need for continuing linkage between the Physics Department and its alumni through the organization of regular alumni homecoming where some alumni are invited to talk before the students and faculty present the range of skills new graduates should possess to get employed. Being exposed to the current employment situation in local and national level can provide them insights of the real world. On-the-Job training (OJT) is already a good direction toward this end, but eliciting opinions from alumni is equally a good move for improving the delivery of the BS Applied Physics program to make it more relevant to the needs of industry and other sectors of society.

References

Agcaoili, L. (2012, October 10). IT-BPO growth to be sustained, to deliver $16B next year. Philippine Star.

Aldaba, R. (2013). The Philippine manufacturing industry roadmap: agenda for new industrial policy, high productivity jobs, and inclusive Growth. (Philippine Institute for Development Studies Discussion paper series no. 2014-32). The Research Information Staff, Philippine Institute for Development Studies. Legaspi Village, Makati City, Philippines. Retrieved from http://dirp3.pids.gov.ph/webportal/CDN/ PUBLICATIONS/pidsdps1432.pdf

Chalamwong, Y., Hongprayoon, K., & Suebnusorn, W. (2012). Skills for Employability: Southeast Asia. *Innovative Secondary Education for Skills Enhancement* (ISESE).

Cleary, M., Flynn, R. and Thomasson, S. (2006) Employability Skills: From Framework to Practice, Developed by Precision Consultancy for the Australian Government, Department of Education, Science and Training, Canberra City.
.

Crebert, G., Bates, M., Bell, B., Patrick, C. J., & Cragnolini, V. (2004). Developing generic skills at university, during work placement and in employment: graduates' perceptions. *Higher Education Research & Development*, *23*(2), 147-165.

Curtin, P. (2004). A Summary of the Report Employability skills for the future. Generic Skills in vocational education & training, Research readings. Adelaide: NCVER.

Delaney, A. M. (2004). Ideas to enhance higher education's impact on graduates' lives; Alumni recommendations. *Tertiary Education & Management*, *10*(2), 89-105.

Eison, J. (2010). Using active learning instructional strategies to create excitement and enhance learning. *Jurnal Pendidikantentang Strategi Pembelajaran Aktif (Active*

Learning) Books, 2.

Fallows, S., & Steven, C. (2000). Building employability skills into the higher education curriculum: a university-wide initiative. *Education+ training*, 42(2), 75-83.

Greatbatch, D., & Lewis, P. (2007). Generic employability skills II. *a paper prepared by the Centre for Developing and Evaluating Lifelong Learning at the University of Nottingham in collaboration with the South West Skills and Learning Intelligence Module at the University of Exeter*.

Grecho, A.S. (2010). Determining Criteria and Indicators for Success in Higher Education Programs Focused on Environmental Sustainability. (Under the direction of Gary B. Blank) ProQuest.

Hanson S. and Overton T, (November 2010). Skills required by new Physics graduates and their development in degree programmes. *Higher Education Academy UK Physical Sciences Centre*

Hooker, M. (1997). *The transformation of higher education*. In D. Oblinger & S. C. Rush (Eds.) *The Learning Revolution*. Boston, MA: Ankler Publishing Company, Inc.

Ivie, R., & Stowe, K. (2002). The early careers of physics bachelors. *American Institute of Physics, Statistical Research Center*, College Park, MD, 2002, AIP Pub. R-433.

Jacobs, H. (2010). *Curriculum 21: essential education for a changing world.* MA: Library of Congress Cataloging in-Publication Data.

Jagger, N., Davis, S., Lain, D., Sinclair, E., & Sinclair, T. (2001). Employers views of postgraduate physicists. Swindon, UK: Engineering and Physical Sciences Research Council. Retrieved September, 22, 2014 from: http://www. employment-studies. co. uk/pdflibrary/1417phys. pdf.

Koehn, E. E. (2001). Assessment of communications and collaborative learning in civil engineering education. *Journal of Professional Issues in Engineering Education and Practice*, *127*(4), 160-165.

Madewell, T. M., Savin, M.C. & Brye, K.R. (2003)Alumni and employer perceptions of crop, soil, and environmental sciences curricula: survey results. *Journal of Natural Resources and Life Sciences Education,* 32, 100-106.

Magtibay-Ramos, N., Estrada, G., & Felipe, J. (2008). An input–output analysis of the Philippine BPO industry. *Asian Pacific Economic Literature*, 22(1): 41-56.

Martin, A. J., Milne-Home, J., Barrett, J., Spalding, E., & Jones, G. (2000). Graduate Satisfaction with University and Perceived Employment Preparation. *Journal of Education and Work*, 13(2), 199 - 213.

Moden, G. O.& Williford, A. M. (1988). Applying alumni research to decision making. *New Directions for Institutional Research*, *1988* (60), 67-76.

National Science Foundation. (2005, July 21). New report stresses importance of science and engineering opportunities for all citizens. Retrieved January 16, 2010, from .

Playfoot, J., & Hall, R. (April 2009). Effective Education for Employment: A global perspective. (A report commissioned by Edexcel and prepared by White Loop). Retrieved December 2, 2014 from www.eee-edexcel.com

Saloma, C. A., Concepcion, G. P. P., & Padlan, E. A. (Eds.).(2008). Selected Essays on Science and Technology for Securing a Better Philippines (Vol. 1). UP Press.

Seetha, N. (2014). Are Soft skills Important in the Workplace?–A Preliminary Investigation in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, 4(4), 44-56.

Shah, M. & Chenicheri, S. N. (2011). Employer satisfaction of university graduates: Key capabilities in early career graduates. In Developing student skills for the next decade. Proceedings of the 20th Annual Teaching Learning Forum, 1-2 February 2011. Perth: Edith Cowan University.

Shah, M., Nair, S., & Wilson, M. (2011). Quality assurance in Australian higher education: historical and future development. *Asia Pacific Education Review,12*(3), 475-483.

Sharma, M., Pollard, J., Mendez, A., Mills, D., O'Byrne, J., Scott, D., Hagon, S., Cribble, J., Kirkup, L., Livett, M., Low, D., Merchant, A., Rayner, A., Swan, G., Zadnik, M &Zealey, W. (2008). What does a physics undergraduate education give you? A perspective from Australian physics. European Journal of Physics, 29(1), 59.

Shin, L. W. & Fatin, F. A. (2012). Physics Studies and Generic Attributes. Procedia-Social And Behavioral Sciences, 56, 691-702.

Schulz, B. (2008). The importance of soft skills: Education beyond academic knowledge. Journal of Language & Communication, 2(1), 146-154.

Stevens, M. J., & Campion, M. A. (1994). The knowledge, skill, and ability requirements for teamwork: Implications for human resource management. Journal of Management, 20(2): 503-530.

Stufflebeam, D. and Shinkfield, A. (2007). Evaluation theory, models, and applications.CA: Jossey- Bass.

Talisayon, S. V. (2006). Development of scientific skills and values in physics education.

Table 1. Job Profile of BS Applied Physics Alumni

Nature of Company	# of alumni employed	Percent (%)
Business Process Outsourcing	20	33.8
Software	11	18.6
Educational Institution (College & High School Teaching)	7	11.9
Manufacturing Industry (Telecommunication and Semi-conductors /Food & Beverage)	7	11.9
Retail Business Company	6	10.2
Graduate program/Physics Research	4	6.8
Self –employed (business)	2	3.3
Banking	1	1.7
Medical program	1	1.7

Table 2. Respondents' Assessment of Employment Need and Learning (Cluster A Generic Skills, Abilities)

Learning Areas	**Employment Need (N)***	**Learning (L)****	**Difference (N –L)**	**p-value**
Cluster A	**Mean ± SD**	**Mean ± SD**		
• critical thinking	4.44 ± .80	4.48 ± .60	-0.04	0.85
• analytical skill	4.41 ± .75	4.22 ± .58	0.19	0.26
• independent learning	4.41 ± .69	4.15 ± .72	0.26	0.13
• written communication	4.19 ± .96	4.07 ± .78	0.11	0.60
• problem solving	4.15 ± .77	4.11 ± .57	0.04	0.82
• oral communication	3.89 ± 1.08	3.93 ± .82	-0.04	0.87
• computer skills	4.44 ± .53	3.78 ± 1.20	0.67	0.14

*1 – none , 2 –little, 3 – fair, 4 – good, 5 – excellent
**1 – not needed, 2 – slightly needed, 3 – moderately needed, 4 – sufficiently needed, 5 –extremely needed

Table 3. Respondents' Assessment of Learning and Employment Need (Cluster B Skills and Abilities)

Learning Areas	Employment Need** (N)	Learning * (L)	Difference (N –L)	p-value
	Mean ± SD	Mean ± SD		
• leadership skill	4.33 ± .97	3.52 ± .81	0.81	0.00
• ability to perform quality work & product	4.87 ± .34	4.10 ± .65	0.77	0.00
• time management skills	4.63 ± .61	3.88 ± .79	0.75	0.00
• Professional ethics	4.58 ± .73	3.97 ± .88	0.61	0.00
• teamwork skills	4.45 ±1.06	3.94 ± .81	0.52	0.00
• ability to learn new skills	4.78 ± .55	4.33 ± .59	0.44	0.00
• responsibility in work	4.81 ± .39	4.26 ± .65	0.44	0.00
• ability to cope with pressure and stress	4.70 ± .57	4.22 ± .74	0.48	0.00

*1 – none , 2 –little, 3 – fair, 4 – good, 5 – excellent
**1 – not needed, 2 – slightly needed, 3 – moderately needed, 4 – sufficiently needed, 5 –extremely needed