A TRACER STUDY OF THE BACHELOR OF SCIENCE IN ENVIRONMENTAL SCIENCE (BSES) GRADUATES OF BSU

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ABSTRACT

The study was undertaken to appraise the employment status, curriculum as well as the advanced potential training needs of graduates of the BS Environmental Science (BSES) Program of the university. A survey was conducted from February 2004 to December 2005. Apparently, the employability of graduates was a 'little low' or probably 'not so high' because the expected market has not responded very strongly and positively to the availability of graduates in the field (supply side). Potential markets could be in the the ever-growing environmental degradation and resource depletion. There was a strong indication that students would be more prepared with the inclusion of an on-the-job training (OJT) scheme in the curriculum, aside from the conduct of a thesis. The offering of a graduate or advanced degree in Environmental Science and related fields is proposed.

KEYWORDS: tracer study, environmental science, benguet state university

INTRODUCTION

Environmental science, according to Cunningham and Saigo (1997), is the systematic study of the environmental and our proper place in it. It is highly interdisciplinary, integrating natural sciences, social sciences and humanities in a broad, holistic study of the world around us. In contrast to more theoretical disciplines, environmental science is mission-oriented. From this vantage point, then, environment is expanded to mean, aside earlier definition that it comprises the circumstances or conditions that surround an organism or group of organisms (traditional view), it also includes the complex of social or cultural conditions that affect an individual or community. Thus, in this new perspective, the technological, socio-economic, cultural and political world, together with the natural (i.e. bio-physical) constitute the environment.

In response to the Earth Summit conducted in Rio de Janeiro in 1987, the Philippines created the Philippine Council for Sustainable Development (PCSD) which was a cross-sectoral representation of society that formulated the country's position to the convention. This was the Philippine Agenda 21, which mandated the integration of environmental concerns in economic development planning and management. The tools for which include Environmental Impact Assessment (EIA), Land Use Planning (LUP) and Natural Resources Accounting and Valuation (NRAV). This requires an environmental education which will result to the development of environmental literacy and responsible citizenry (Moldez, et al., 1995). Such was then seen to necessitate the training and development of a pool of environmental specialists or professionals, to respond to this new challenge. This was then the rationale for offering a degree program, specifically the Bachelor of Science in Environmental Science (BSES) to address this emerging need.

In an earlier study conducted by the Asian Development Bank, a projected need for about 10,000- 15,000 environmental professionals in government and non-government organizations and private corporations for the mid-1990s up to

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the year 2010 was raised (ADB, 1991 as cited Moldez, et al., 1995). Moreover, the types of job the graduates expect to occupy include the following: environmental officers (planners, managers, etc.) of various government agencies (e.g. DENR, EMB, DA, NAPOCOR, etc.), non-government organizations and private corporations; teaching; and research career in various research agencies.

The BS Environmental Science Program (BSES) of the University was first offered by the Department of Biology of the College of Arts and Sciences (CAS) in 1995. The College initially offered 2 majors as options: Resource Management and Socio-ecology. The first batch graduated in 1999. As of May 2003, it has produced about 208 graduates (BSUAAI and Comila, 2003).

In recent years, some of these graduates have been luckily employed in various occupations, related to their field of specialization, in private companies, government agencies, non-government organizations (NGOs) and others. With the competition for available positions in the workplaces becoming more intense as more and more graduates of various courses are produced annually, the rate of unemployment in the country has dramatically risen. Thus, there was a need to look into the relevance of and present challenges to the degree program in terms of the potential marketability of its graduates as well as its contribution to manpower requirements in environmental science-related jobs. The study also sought to come up with insights/possible improvements for further strengthening the curriculum of the BSES.

In as much as there is a lack of appropriate courses to further their knowledge and training in their own field of specialization after the baccalaureate degree, there was also a necessity to assess or determine advanced training needs (i.e. MS Environmental Science) of potential clientele in the field of environmental science. Thus, this would benefit graduates, especially but not limited to Environmental Science majors.

The study was undertaken to assess the employment status as well as the advanced potential training needs of BSES graduates. Specifically, the research aimed to:

1. Determine the present and previous employment/work experiences of BSES graduates in environmental science-related occupations;

2. Identify perceived strengths and weaknesses of the curriculum of the BSES graduates in relation to their performance in environmental science-related occupations; and,

3. Appraise the prospects of offering advanced degree/graduate program in environmental science and related fields.

MATERIALS AND METHODS

The study primarily employed the survey method. A semi-structured interview schedule was prepared for this purpose. All graduates of the program have been considered potential respondents in this study. However, since only a segment of the entire population are believed to be presently working/residing in the Baguio-Benguet area, purposive sampling was done to get as many graduate-respondents as possible. This entailed contacting and establishing conduits via class representatives. The questionnaires were either sent to the identified alumni or were stationed in designated alumni/class representatives' addresses. The use of text messaging was very helpful for this purpose.

The questionnaires were also floated during special occasions in the University such as during Christmas programs, University Foundation Day Celebrations and Commencement Exercises. During these periods, individual in-depth or group discussions were also done to probe deeper into the responses given. The quantitative data were analyzed using descriptive statistics. The qualitative analysis was used to reinforce the results of the quantitative analysis. The survey was conducted from February to November 2004, then was continued until December 2005.

RESULTS AND DISCUSSIONS

The Respondents' Background

Out of the 94 alumni-respondents interviewed, about 41% were males, and 58% were females (Table 1).

Table 1. Gender distribution of the respondents

GENDER	N	%
Males	39	41.5
Females	55	58.5
Total	94	100.0

Almost all of the alumni-respondents had Resource Management as their area of specialization, at 92.6%, while a small fraction (7.4%) majored in Socio-ecology (Table 2). Historically, only the latter field of specialization was offered to the first three batches of the BSES alumni (i.e., batches 1999-2001). Thereafter, the said major was temporarily suspended.

Table 2. Area of specialization

MAJOR	N	%
Resource management	87	92.6
Socio-ecology	7	7.4
Total	94	100.0

In Table 3, it is shown that a total of 33 graduates (34.1% of them) have civil service eligibilities, whether sub-professional, professional, or both. A greater percentage of the alumni interviewed had no eligibility. It can be surmised at this point that more of those employed are probably connected with non-government groups and institutions, or in other words, with the private sector.

Table 3. Eligibilities held by the respondents

TYPE OF ELIGIBILITY	NO.	%
Sub-professional only	4	4.3
Professional only	18	19.1
Both (sub-prof. & prof.)	11	11.7
No eligibility	61	64.9
Total	94	100.0

It is noteworthy to mention that in the entire history of the BSES Program of the University, two (2) magna cum laude and seven (7) cum laude graduates have been graduated to date.

Employment or Work History of the Graduates

At the time the study was made (i.e. February 2004–December 2005), more than half of the respondents (53.2%) were then employed, while about 46.8% did not have any current job (Table 4).

Table 4. Employment status* of the respondents

	n=94	%
Currently employed	50	53.2
Not currently employed	44	46.8
Total	94	100.0

**at the time the study was being conducted, i.e., February 2004 – December 2005*

In terms of the history of the alumni's employment, from the time they graduated from their degrees, about the same percentage (52.1%) had previous employment, with a little less than half of them (47.9%) having no previous employment at all (Table 5). Although far from being ideal, this employment level is better off compared to the projections for the graduates for the end of school year 2005 that about 60% of the graduating students would end up jobless or would not be absorbed by the available labor/ employment opportunities, a national forecast on television given by the ABS-CBN news sometime in April 2005.

Table 5. Previous employment of the respondents

	n=94	%
Previously employed	49	52.1
No previous employment	45	47.9
Total	94	100.0

About 46.9% of those who were employed had experience in environmental science-related jobs (Table 6). These jobs include those related to agriculture, forestry and

environment, and science and in line with teaching, research, administration, community organization, project-based occupations and natural resources management functions. A few of these graduates were actually or have had experienced teaching Environmental Science subjects or being teachers in Environmental Science/Environmental Management curricula. In addition, one respondent was said to be self-employed or was engaged in full-time business. A little more than half were employed in non-environmental science related jobs (26.6%). This includes occupations such as laborer, salespersons, office clerk, etc.

Table 6. Type of current* employment of the graduates

TYPE	n=49	%
Environmental Science (ES) –related	23	46.9
Business/Self-employment	1	2.0
Non-ES related	25	51.1
Total	49	100.0

**at the time the study was being conducted, i.e., February 2004 – December 2005*

Shown in Table 7 is a comparison between the two majors and their distribution in environmental science-related jobs (ES-related), non-environmental science (non-ES) jobs, and no jobs. It should be noted that the data includes both current and previous work experiences of the graduates across the type of employment. This means that in the resource management major (1st column) with respect to the ES-related job (2nd & 3rd columns), there were 32 graduates who were currently employed in jobs related to their field of specialization (at the time the study was undertaken, i.e, February 2004 – December 2005), and also those who had non-ES work experience at the time the study was done, but were previously employed in ES-related work. Alternatively, when both majors (1st column) are compared with non-ES jobs (4th & 5th columns), there were 36 graduates who worked in jobs not necessarily related to their field (or have not experienced working in ES-related jobs). It can also be seen in the table that about 36.2% (34 out of the 94 respondents) had experience working in ES-related jobs, whether at present (at the time the study was done) or in the past. This is to say that roughly one third of the surveyed graduates had practiced or have been practicing their field of expertise. When this segment of the surveyed respondents are added to those who worked in non-ES jobs, a total of 70 respondents have been employed. This means that about two-thirds of the surveyed graduates were able to find work. Finally, it means that about a third of the respondents were never employed nor were working. This result, although not entirely bright, is apparently better compared to the national situation, where it is projected that about 60% of the graduating students by the end of School Year 2005 would find no jobs at all.

Table 7. Type of previous and present employment based on the major field

	ES-related		Non-ES		No job		Total	
Major	No.	%	No.	%	No.	%	No.	%
Resource Mgt.	32	34.0	32	34.0	23	24.5	87	92.6
Socio-ecology	2	2.1	4	4.3	1	1.1	7	7.4
Total	34	36.1	36	38.3	24	25.6	94	100

The cross tabulations in Table 8 apparently depicts the situation that the possession of a civil service eligibility had little contribution to securing an employment as only about one third of the surveyed graduates had eligibilities. This is probably true for the reason that employment in government, which required the possession of those eligibilities, was very limited; on the other hand, employment in the private sector does not essentially require those eligibilities. The survey also revealed that most of those employed or those who had previous employment but were not employed at the time the study was conducted (again, whether in ES-related or non-ES related jobs), were with the private sector—private schools and colleges, NGOs, management firms, among others.

Table 9 reflects the personal considerations of the respondents in the process of application to a particular job. It is reflected in the table that the highest percentage of them ranked salary as the most important consideration (34.0%).

Table 8. Type of previous and present employment based on civil service eligibility

	ES-related		Non-ES		No job		Total	
Eligibility	No.	%	No.	%	No.	%	No.	%
With eligibility	17	18.1	13	13.8	3	3.2	33	35.1
No eligibility	18	19.1	25	26.6	18	19.1	61	64.9
Total	35	37.2	38	40.4	21	22.3	94	100

This was followed by opportunity present at the time of application (24.5%) and outlook for long-term professional development (14.9%). For those ranked number 2, opportunity (20.0%) was followed very closely by salary (19.4%) and challenging work (19.4%).

Table 9. Personal considerations in the application/ selection for a job

Factor	Rank No. 1		Rank No. 2		Rank No. 3	
	No.	%	No.	%	No.	%
Salary	32	34.0	18	19.4	11	11.8
Opportunity	23	24.5	22	20.0	14	15
Outlook for long-term professional development	14	14.9	-	-	8	8.6
Stability	11	11.7	12	12.9	3	3.2
Location	8	8.5	10	10.8	13	14
Challenging work	3	3.2	18	19.4	23	24.7
Near residence	1	1.1	1	1.1	6	6.5
Competition	1	1.1	2	2.2	9	9.7
Family	1	1.1	2	2.2	3	3.2
Freedom	0	0	1	1.1	2	2.2
Others						
Total	94	100	86	89.1	92	98.9

Note: Those ranked No. 4 and below are not reflected

It can be seen in Table 10 that a high percentage of the respondents believed that the degree earned was the most important factor or consideration in the hiring of the job applicant (39.0%). Also ranked number 1, although in lower percentages, are being acquainted with the owner or other employees and an impressive interview (both at 22.0%). For second-ranked factors, academic performance was seen as a very important factor in the recruitment process (28.8%) followed closely by the degree one earned (27.1%).

Table 10. Important perceived factors in the hiring of a job applicant

Factor	Rank No. 1		Rank No. 2		Rank No. 3	
	No.	%	No.	%	No.	%
Degree	23	39.0	16	27.1	14	23.7
Acquainted with owner/other employees	13	22.0	5	8.5	7	11.9
Impressive interview	13	22.0	10	16.9	8	13.6
Academic Performance	4	6.8	17	28.8	14	23.7
No other applicants	4	6.8	2	3.4	4	6.8
School's prestige	2	3.4	8	13.6	11	18.6
Total	59	100	58	98.3	58	98.3

Note: Those ranked No. 4 and below are not reflected

Curricular Strengths and Weaknesses

As regards curriculum, the alumni-respondents were asked to voice their opinion or perception regarding the contribution of the conduct of a thesis in finding a job, or alternatively, in performing their job (Table 11). 20.2% of the respondents answered in the affirmative, 60.6% in the negative and 19.1% undecided (answered 'maybe'). About half of those who answered in the affirmative have indicated that the contribution of the thesis to these aspects was 'strong.' The other half had indicated 'moderate' as well as 'little' contribution.

Table 11. Perceived positive contribution of the conduct of thesis to the hiring of the applicant

	N	%		N	%
Yes	19	20.2	Strongly	10	52.6
No	57	60.6	Moderately	5	26.3
Maybe	18	19.1	Little	4	21.1
Total	94	100.0	Total	19	100.0

In terms of the subject preparations (courses taken under the curriculum), a greater percentage of the respondents have indicated a positive contribution in finding a job, or alternatively, in performing their jobs, at 44.7% (Table 12). This was followed by 35.1% and 20.2% for the answers in the negative and undecided ('maybe') categories, respectively. For those who answered in the affirmative, about equal percentages of the respondents have indicated a 'strong' and 'moderate' contribution.

Table 12. Perceived positive contribution of the subject preparations (theory) to the hiring of the applicant

	N	%		N	%
Yes	42	44.7	Strongly	20	47.6
No	33	35.1	Moderately	18	42.9
Maybe	19	20.2	Little	4	9.5
Total	94	100.0	Total	42	100.0

On the question whether the field or laboratory activities have contributed something in finding a job, or alternatively, in performing a job, again a greater percentage of the respondents have expressed a beneficial contribution (45.7%), while those in the negative and 'maybe' responses had lower percentages at 37.2% and 17.1%, respectively (Table 13). For those who positively answered the question, about 48.8% have indicated that the beneficial effect was 'strong' and 46.5%, 'moderately strong.'

Table 13. Perceived positive contribution of the field/ laboratory activities to the hiring of the applicant

	N	%		N	%
Yes	43	45.7	Strongly	21	48.8
No	35	37.2	Moderately	20	46.5
Maybe	16	17.1	Little	2	4.7
Total	94	100.0	Total	43	100.0

Also, the respondents were asked of their opinion if there was a need to open other majors or fields of specializations within the BSES curriculum, an overwhelming 87% of the respondents indicated that such was needed, with only about 12% of the remaining respondents who saw no need or who have not made up their mind about this (Table 14).

Table 14. Other fields of specialization to be opened

	N	%
Yes	82	87.2
No	6	6.4
Maybe	6	6.4
Total	94	100.0

Based on the responses in Table 15, it can be seen that the major Waste Management and Pollution was suggested to be top-ranked academic major which should be offered/opened (39.3%); this was followed by the major General Resource Management (21.4%) and Environmental Engineering (15.5%). Socio-ecology major came in fourth with 14.9%. On the other hand, the majors ranked second were the following: General Resource Management (26.2%) followed by Waste Management and Pollution (21.4%). Apparently, Waste Management and Pollution was seen as a promising major, probably due to the fact that solid waste management for one is a pressing concern in these contemporary times. It has become increasingly evident that local government units (LGUs) have started getting serious with the full implementation of Republic Act 9003 of 2000 (or Ecological Solid Waste Management). Moreover, the passage of the Clean Water Act or Republic Act No. 9275 has brought to the fore urgent concerns for the dwindling water resources in the country, brought chiefly by the pollution of water resources or water bodies, among other causes. These concerns have probably left an impression in the minds of the graduates that this scenario would require the services of competent environment professionals.

On the question of whether an on-the-job training (OJT) is a good alternative to or substitute for the conduct of a thesis, more than half of the respondents (54%) have expressed their opinion in the affirmative, the rest in the 'no' and 'maybe' responses (22% and 23%, respectively; Table 16).

Table 15. Ranking of major fields of specializations to be offered

MAJOR	RANK NO. 1		RANK NO. 2	
	No.	%	No.	%
Waste Mgt & Pollution	33	39.3	18	21.4
General Resource Management	18	21.4	22	26.2
Environmental Engineering	13	15.5	12	14.3
Socio-ecology	12	14.3	12	14.3
Environmental Economics	6	7.1	8	9.5
Ecotoxicology	2	2.4	12	14.3
Total	84	100.0	84	100.0

Table 16. On-the-job training (OJT) as an alternative to the thesis

	N	%
Yes	51	54.3
No	21	22.3
Maybe	22	23.4
Total	94	100.0

In terms of the preference of the alumni-respondents, it is revealed in Table 17 that a high segment of this sample population had indicated an inclination for both the conduct of a thesis and undergoing an on-the-job (OJT) training as part of the curriculum (75%). A considerably lower percentage of the respondents have indicated their selection of a thesis alone or an OJT separately.

Table 17. Preference of the respondents to OJT and conduct of thesis

	N	%
Thesis	8	8.5
OJT	15	16.0
Both	71	75.5
Total	94	100.0

Advanced Studies

The alumni-respondents were also asked of their opinion regarding the need for them to take an advanced degree course in Environmental Science. Recorded in Table 18 are the responses. About two-thirds of the respondents (66%) have suggested that such need be considered. Only about a tenth of the respondents (9.6%) have given a negative response; moreover, about a quarter of them (24.4%) have not made up their minds at the time the study was done.

Table 18. Perceived need to take an advanced degree in Environmental Science (MS ES)

	N	%
Yes	62	66.0
No	9	9.6
Maybe	23	24.4
Total	94	100.0

Going further, when asked whether they had plans to enroll especially if the University offers advanced degree in this field of specialization, about 48% have indicated their desire to enroll (Table 19). About 10% have answered in the negative. Those undecided have apparently increased to 40%.

Table 19. Plans/intentions of the alumni to enroll in advanced course in ES if offered

	N	%
Yes	46	48.9
No	10	10.6
Maybe	38	40.4
Total	94	100.0

The respondents were also asked of their opinions on what major subjects to be offered as part of the curriculum, to which a few responded with more than one suggested major subject. The subject Waste Management and Pollution, which includes industrial waste and pollution management, topped the list with about 38.3% of the respondents (Table 20). This finding is consistent with the results presented in Table 15 earlier, which showed such (Waste Management) as the top suggested field of specialization needed. This also underscores the fact that the twin issue on solid waste management and pollution is a visibly growing problem in urban as well as urbanizing ('rural') communities and which

need the services of environmental professionals in this particular area of concern. The others are depicted in Table 20.

Table 20. Subjects/majors to be offered under an MS ES degree

Subject/major	N*	%*
Waste Management & Pollution	36	38.3
Resource Management	18	19.1
Socio-ecology	13	13.8
Environmental Engineering	12	12.8
Environmental Economics	10	10.6
Environmental Impact Assessment	5	5.3
Biodiversity	4	4.3
Aquatic Resource Management	3	3.2
Toxicology	3	3.2
Land Use Planning	2	2.1
Ecological Agriculture	1	1.1
Environmental Law	1	1.1
Geographic Information System	1	1.1
Meteorology	1	1.1
Soil & Water Conservation	1	1.1
Total	111	118.1

**Multiple response*

SUMMARY, CONCLUSIONS & RECOMMENDATIONS

Summary

Over-all, a little more than half of the 94 respondents (50 alumni or 53.2%) were found to be employed at the time the study was being conducted (February 2004 – December 2005). Of this number, 23 (or 24.5% of the respondents) had the experience of being employed in environmental science-related (ES-related jobs) jobs or jobs that would fit the baccalaureate preparation of the respondents. As used in the study, ES-related jobs include, but not limited to, agriculture, forestry and environment, and science and in line with teaching, research, administration, community organization, project-based occupations and natural resource management functions.

As regards curricular strengths and weaknesses, it was generally perceived by the respondents that the theoretical preparations (i.e. the subjects in the curriculum) have positively contributed to their being hired/employed and job performance. Furthermore, the laboratory/field activities were apparently perceived to have a positive bearing in the hiring process and in the workplace. However, in the conduct of the thesis, it was not perceived to have contributed to their hiring nor in the performance of their jobs. About 54% of the respondents, had a positive outlook towards the inclusion of on-the-job training (OJT) as an alternative to the thesis; it must be stressed at this point, that this is the desire of the respondents only if the thesis is not a part of the curriculum or if given the preference to choose. However, it seems quite strongly that more respondents prefer to have both thesis and OJT scheme (75.5% of the respondents).

It could be seen that most of the respondents perceived a need to have an advanced degree in their field of specialization (66% of the respondents). When asked of their intentions to enroll if a graduate degree is offered, 48.9% of the respondents answered affirmatively, 40.4% were still undecided, and only 10.6% answered in the negative. The major subjects perceived to be important to be offered were Waste Management & Pollution, Environmental Engineering, Environmental Economics, aside from the two majors originally offered (Resource Management and Socio-ecology).

Conclusions

Although the expected market has not responded very strongly and very positively to the availability of graduates in the field (supply side), it can be said that its employability is a "little low," or probably, "not so high." On the other side of it, it cannot also be said that the degree is totally

unmarketable, since still a good number have been employed.

On-the-job training with thesis is a better alternative implying a more realistic exposure to the workplace, especially in agencies, doing environment-related functions as well as in the industry. The curriculum which is geared towards training in agriculture and forestry, for one, has probably led to some competition with graduates in these respective fields. Apparently, subjects geared towards the application of environmental science in industries (such as environmental engineering, pollution, etc.) is seen as a major shift in focus. Specifically, this should be oriented towards industrial ecology.

There is also a huge potential clientele for those pursuing graduate course in environmental science. Similar to the UPLB model (that of the School of Environmental Science and Management, SESAM), graduates of science-related courses as well as those from the social sciences (e.g anthropology), and even from mathematical sciences, can be accommodated into a proposed graduate program in Environmental Science.

Recommendations

Likely with the ever-growing environmental degradation and resource depletion happening around now and especially into the future, it may be wise to once more review contemporary approaches and policies regarding environmental protection and management, as more intense environmental problems will be more strongly felt since their long term effects (environmental degradation) have now come to be significantly demonstrable. Thus, environmental science as a discipline shall hopefully be given more importance, recognition and stature, and ultimately a better marketability of its professionals to respond to this emerging challenge.

In terms of curriculum, it should look into improving the analytical, laboratory and field work skills of the students in order to enhance more their competitiveness. Moreover, the recommendation for the inclusion of an on-the-job training scheme is most welcome. Also, subjects that allow the students to become more self-reliant should be introduced. A possibility lies in the inclusion of entrepreneurship courses, which make the graduates be trained for environmental entrepreneurship and related ventures. They should also be nurtured in the vantage point that an office position is not always available for the newly graduated student, because it has instead increasingly become more and more improbable. A shift to the application of the course to industrial settings has apparently become more viable direction. Lastly, the proposed advance/graduate course in environmental science could be geared towards equipping the student a managerial and analytical stance, in order to be able to apply management approaches to environmental issues and problems in their chosen fields of endeavor.

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