Report on the Qualitative Analysis of Five Open-ended Questions from the Carleton College Off-Campus Studies Alumni Survey of the Marine Biology Seminar

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Executive Summary

The Marine Biology Seminar, Carleton's longest-running off-campus program, was offered alternating years between 1972 and 2004 and provided students the opportunity to travel to locations in California, Washington, Bermuda, Australia, New Zealand, or Cook Islands for a period of 10 weeks during the winter term (January-March). Lead by Carleton Professor Gary Wagenbach and local experts, a group of 25 students engaged in the study of marine ecosystems through extensive fieldwork, lecture, discussion, and small independent research projects. Students' study included a research methods course focusing on the analysis of biological topics, with emphases on ecology and conservation biology. Hands-on experience in conducting field research was complemented by extensive exploration of local cultural and environmental issues, such as settlement history, agriculture and importation of non-native species, climate, and environmental policy. In addition to fieldwork, program participants engaged in vigorous hiking, snorkeling, and scuba diving. In all, 467 students have participated in the Marine Biology Seminar.

To investigate outcomes of participation in the Marine Biology Seminar, the Carleton College Off-Campus Studies program conducted a longitudinal alumni survey. This survey, comprised of quantitative and qualitative items, explored the affects of program participation on students' intellectual and personal development, including impacts on major and GPA, career choice and pathway, reflections on field-based learning, skill acquisition, as well as changes in participants' world view. Five open-ended questions were also included on the survey to capture participants' own views on gains from the experience and information concerning alumni's career development. Of the 467 participants contacted, 241 (119 females, 94 males, and 28 not identified) responded. This represents a response rate of 52%. To better understand and complement analysis of the quantitative survey data, qualitative analysis of the five open-ended questions was also conducted. This executive summary discusses findings from the qualitative analysis.

Method

Each of the five open-ended questions was searched to identify impacts on students' career choice and pathways, learning gains, and the influences of study abroad and experiential teaching and learning attributed to participation in the Marine Biology Seminar, as well as any issues of gender or other emergent issues important to understanding the contribution of the Marine Biology Seminar to students' educational experience. Using a qualitative method of content analysis, text segments referencing distinct ideas were tagged by code names. Codes were not preconceived, but empirical: each new code marked a discrete idea not previously

raised. Using *NVivo*, a computer software program, codes and their associated text passages were linked, amassing a data set of codes and their frequency of use. Codes similar in nature were grouped together to define themes; the clustered frequencies represented as grouped themes, or "parent" categories, describe both the range and relative weighting of issues in participants' collective report.

The five open-ended survey questions analyzed were:

Question 11. If the program had a significant impact on your academic experience at Carleton, describe your recollections of that impact as a student and your reflections on that impact from your current perspective.
Question 16. Describe your professional path from Carleton through graduate school (if applicable) to your career(s)/employment.
Question 17. How did the marine biology program influence your world view?
Question 18. What do you remember as the most important or memorable experience during your marine biology program?
Question 19. Other comments?

Analysis of the 841 written responses produced a total of 2911 discrete observations across the data set. Women's written responses represent 56% of the text data sample and men's written responses 44% of the sample.

Observations were sorted according to textual content into distinct categories. These parent categories broadly divided into two groups: observations on program outcomes and general observations. Broadly, analysis of the five open-ended questions identified types of gains derived from participation in the Marine Biology Seminar, identification of students' career choices and pathways; program evaluations, and perceptions regarding how gains were produced.

Observations of Program Outcomes

Collectively, alumni's observations of the Marine Biology Seminar's program outcomes that detail learning gains, influences and direct effects on professional pathway and career choice, as well as the transferable value of many program gains to other contexts and life, in general, provide a rich, well-rounded description of the experiential benefits of program participation and their tremendous, life-changing impacts.

- *Self-development* (n=450; 15% of women's response, 16% of men's responses)

The highest number of gains observations (15%) reported in alumni's comments described the benefits of being exposed to new places, peoples and culture, personal growth, and increased appreciation for the ecological and cultural diversity existing in the world. Overwhelmingly, alumni described participation in the Marine Biology Seminar as affecting their personal development, where travel and exposure to new experiences opened a wider, more critical understanding of the world. The learning environment immersed them in novel ecologies and environments, and imparted a deep respect for the cultural, environmental and ecological diversity of life on Earth. Almost all of these observations (96%) offered accounts of how participants' program experience had opened up their eyes and minds, expanded their

understanding and views of the world, and strongly contributed to their self-development. Being exposed to new places, people and cultures imparted lifelong gains. Some alumni commented that participating in the program gave them insights into themselves as individuals, laid a foundation of personal values committed to respect for the environment, and induced the development of lifelong passions for scuba diving, the ocean and travel, among others. Many alumni particularly emphasized a greater understanding of ecological and environmental diversity and macro-micro connections as a result of experiencing new places and cultures.

- *Personal-professional gains* (n=175; 6% of both women's and men's responses)

Observations in this category described personal gains of developing peer and professional collegiality with program participants, specific comments on the highly valuable contributions made by Program Director Gary Wagenbach, and alumni's reflections on gains in confidence related to their research work. In this set of observations, 49% of participants' responses emphasized the benefits of peer and professional collegiality built upon close, sustained interaction. Some observations emphasized the benefits of interacting with TAs, staff or local experts in developing professional collegiality. Praise, thanks, and other alumni comments focused on the important and valued contributions of Program Director Gary Wagenbach to students' personal and intellectual development. Thirty-nine percent of program participants' observations in this category highlighted Dr. Wagenbach's dedication, excellence as a teacher, and generous nature in contributing so much to the program and their lives. A smaller number of comments in the "personal-professional gains" category (13%) discussed participant gains in confidence related to work in science research: gains in confidence to do research and to contribute to science.

- *"Thinking and working like a scientist"* (n=173; 6% of both women's and men's responses)

This category of gains describes participants' intellectual gains associated with understanding how science and field research works in hands-on practice, as well as increases in knowledge *per se*. Fifty-seven percent of observations comprising this set of gains mentioned increased understanding of how field research is conducted through their applied learning. Alumni observations also discussed developing their intellectual ability to develop a research question, and plan and carry out independent research. Alumni also said that they developed sharper critical thinking and problem-solving skills as a result of their hands-on engagement in field research. In addition to these applied intellectual gains in "thinking and working like a scientist," participant responses also described gains in knowledge, particularly in their understanding of the macro-micro connectedness of ecological and environmental systems (43% of alumni's observations in this category).

- *"Becoming a scientist"* (n=159; 6% of women's responses, 5% of men's responses)

Observations in this category are comprised of participant accounts describing the development of attitudes, traits and behaviors that underpin work as a professional scientist. They also reflect as a gain increased understanding of the nature of research work. Though students are largely unaware of professional implications of these gains, they do recognize shifts in themselves and their understanding.

Alumni observations collected in this category emphasized participants' gains from conducting independent research. These experiences heightened intrinsic interest in learning and increased their understanding of how scientists practice their profession. Some responses

mentioned learning to think creatively and a greater willingness to take risks, showing the development of other attitudes and traits fundamental to working in research. Alumni also described how the experience opened their eyes to what field work was actually like in practice and helped them to realize that research requires either natural or acquired temperamental attributes, such as patience and perseverance. Other alumni responses noted a shift in epistemological understanding of science and increased appreciation in regard to the complexity of knowledge construction.

- *Career clarification* (n=111; 4% of women's responses, and 3% of men's responses)

This category of gains includes participants' observations on program outcomes associated with helping them as students to clarify the suitability of possible career choices, including choice of major, field of study, graduate school, and professional pathway. This set of observations described how field work experience increased participants' interest in studying science, confirmed and solidified their interest in a field of study, introduced a new area of interest, or clarified for them which field of study to pursue. A number of participants' responses stated that the experience helped them realize how much they "loved" doing research. (n=13). A number of participants' responses also show that some determined that "research is not for me" (n=8). Other observations in this category described how the Marine Biology Seminar increased or confirmed participants' interest in pursuing graduate study.

- *Gains in skills* (n=19; 1% of both women's and men's responses)

Participants' comments in the skills category include alumni observations on gains in: observation skills, learning to present research work, working collaboratively in a group, time management skills, and learning drawing skills.

- *Enhanced preparation for future work and graduate school* (n=15; 1% of women's responses and <1% of men's responses).

Responses in this category discussed ways in which program participation had enhanced alumni's preparation for professional work and graduate study and included descriptions of their research work as valuable "real-life experience." A few alumni mentioned that they had been hired for a job based on their Marine Biology Seminar research experience, and that program participation had led to graduate research fellowships or awards in medical school. One response noted that the experience had "boosted" his résumé.

- *Causal statements of program's effects on career pathway* (n=111; 3% of women's responses and 5% of men's responses)

Counted separately in this category of benefits, alumni statements of program effects on choice of major, field of study, graduate school and career pathway document the impacts of the Marine Biology Seminar on participants' future careers. Different from learning gains comprising categories discussed earlier, observations in this set of responses are direct statements of how program participation determined participants' decision-making as students' negotiating early career choices, such as disciplinary major and field of study, and later, whether or not to pursue graduate study (4%). Alumni responses in this category show the strong influences and lifelong impacts of this program on some participants' career choices and provide empirical evidence of the longitudinal impacts of the Marine Biology Seminar on students' career choices and pathways.

- *Transfer of gains to coursework, work, and life* (n=69; 2% of women's responses, 3% of men's responses)

In this final set of observations on program effects, alumni responses collected in this category discuss the transferable value of many of the gains derived from participants' experience. Most of these observations (51%) described the relevancy of gains to their current work and professional practice. Participants who had gone on to teach in academe, K-12 science education or in science education outreach work, remarked how program participation shaped what and how they taught. A quarter of alumni responses in this category (24%) also noted how gains influenced and transferred to life, in general. Some participant responses (12%) noted the transfer of program gains, such as increased interest in science and presentation skills, to subsequent college coursework and graduate study.

General Observations

The majority of alumni responses collected in categories grouped under general observations offer details concerning participants' career pathways. Question 16 asked alumni to describe their career pathway. In response, alumni offered descriptions of their first and next steps beyond graduation from Carleton. These descriptions were categorized largely in four ways:

- professional pathway (16%)
- identification of career (6%)
- identification of academic degree (4%)
- career plans (1%)

Thus several categories grouped under general observations provide different types of information relevant to identifying particular career outcomes of Carleton alumni who had participated in the Marine Biology Seminar. Collectively, these four categories provide a broad view of alumni's academic and professional career pathways.

The remaining categories grouped under general observations were comprised of participants':

- program evaluations (13%); and
- perceptions of how gains from the Marine Biology Seminar were produced (12%).

As some methodological issues emerged during the analysis of participants' career-related observations it will be helpful to discuss the nature of these issues before presenting results concerning alumni's career paths.

Because this survey sampled all alumni who had participated in the program from its beginning, respondents were necessarily at different stages in their professional careers. Those farthest along were established as faculty members, doctors or in other professional careers; some were working in post docs or fellowships; some were still in graduate school, etc. Thus participants' responses were quite various and complex to a greater or lesser degree. Because analytical coding of participant observations was not always able to tie particular codes together in temporal order and because alumni responses often lacked specificity (e.g., mentions of continuing on to graduate study, without stating whether they were pursuing a Master's or PhD

program, or a particular field of study) it was not possible to clearly distinguish exact career pathways.

Two factors confound a simple interpretation of results of participants' career outcomes based upon collective counts of numbers of alumni observations. In the case of the "professional pathway" category, there is a larger number of observations on "first, second, and next steps" (i.e. n=205 and n=179) over numbers of individual participants (n=113 women and n= 85 men). This arises due to the greater complexity of many career pathways, e.g., multiple steps (internship, work, Peace Corps, then pursuing advanced study vs. going directly on to graduate school after baccalaureate graduation). A second factor affecting results is that not all participants were careful enough to provide particular details of the type of advanced degree they had earned (Master's or PhD) or a specific field of study. These variances in the data content skew results based on collective counts of observations when trying to identify and report alumni career outcomes.

However, nearly all participants responding to this survey answered Question 16, which asked them to describe their career pathway. Of the 119 known women, and 94 known men, responding to this survey, 113 women (95%) and 85 men (90%) provided a written answer to this question. In addition, virtually all participant descriptions of and information about their career pathways was found in alumni's answers to Question 16. Since participants' provided a single written response to the question, and since almost all comments and details concerning alumni's career pathway were offered in answer to this one question, we can be fairly confident that counts of particular types of participant observations (i.e., describing when a student went to graduate school, or identifying a career or a degree) represent the actual number of individual alumni reporting this information. Too, when it was possible to distinguish that observations offered in answer to other questions were *not* a duplication of an answer given to Question 16, these observations were included in the analysis, adding further solidity to results based on numbers of participants providing a response.

To provide a clearer picture of participant career outcomes than results based on collective counts of observations could provide, I took numbers of observations that were seen as reasonably reflecting actual individuals and calculated these as a percentage of the women and men who provided a written response to Question 16 (i.e., 113 and 85 respectively). Thus, in reporting career outcomes, results of the data are more accurately given as a calculation of observations representing *actual numbers* of participants offering a particular type of observation. Yet, because collective counts of observations are relevant to determining the range and weighting of discussions across the data set (i.e., showing proportions of responses of a particular kind), these are useful for interpreting the *types* of observations alumni offered and how frequently each was mentioned.

- <u>*Professional pathway*</u> (n=456; 15% of women's responses, 16% of men's responses)

The "professional pathway" category represents the largest collection of participant observations in this the data set (16% of all observations). The majority of these observations described alumni's first, second and next steps in their early career pathway and provide a longer view of alumni's academic and professional career pathways. Participants' comments detailed common steps, such as going directly into graduate school or working for a period of time and

then pursuing an advanced degree, among others. To reiterate, since a collective count of participant observations describing career steps is skewed due to the complexity of some alumni's career paths, results of numbers of participants who pursued an advanced degree is best represented by looking at numbers of respondents who provided this information. Aggregated data show that **76 women (67%) and 72 men (87%) responding to the survey mentioned, ultimately, *continuing on to advanced study* in a graduate, medical or other professional degree program as a first, second or next step on their career path following graduation from Carleton (n=113 and 85, respectively).** *However, some bias in these results is likely due to: the quality of students who self-select into this type of college and this type of program; and the self-selection of successful alumni choosing to respond to this survey.*

- *Identification of academic degree* (n=125; 4% of both women's and men's responses)

Of women and men responding to this question (n=113 and 85, respectively), **49 women (43%) and 41 men (48%) mentioned that they were *currently in a graduate, medical or other professional degree program*, or that they *had earned a graduate, medical or other professional degree.*** It should be noted that some participant responses lacked specificity: not all participants' identified an academic degree. In looking at collective counts of observations, 80% of participants answering Question 16 mentioned either that that they were currently in a graduate, medical or professional degree program, or that they had earned an advanced degree in science, medicine or other professional field. Another 19% of alumni mentioned continuing on to graduate study in a *non-science field.*

- *Identification of career* (n=172; 6% of both women's and men's responses)

Many participant responses concerning their current professions also lacked specificity. For example, a career description such as "research scientist" does not tell the reader the context (industry or academe) or a field of study *per se*. Participants' also described similar careers in varying ways, i.e., "professor," "faculty position," "academic setting," etc. Because respondents did not always provide exact information, results based on numbers of observations are skewed downwards. For this reason, results of numbers of participants who identified a career are best represented by looking at numbers of respondents (i.e. n=113 women and n=85 men). **Analysis of numbers of alumni respondents *identifying a career* indicate that 64 women (57%) and 59 men (69%) worked in a science-related, medical or other professional career.** By number of observations, alumni responses show that many (21%) worked in the field of medicine, with 18% following a career in academe, 10% in an area of marine, biology, ecology or environmental science, and 8% in education. Another 11 women (13%) and 7 men (11%) mentioned careers in a *non-science field*. Eight other women described their career as a "stay-at-home mom." No men offered this comment.

- *Career plans* (n=41; 1% of both women's and men's responses)

Most observations on career plans discussed participants' *intention* to pursue a science-related career. Alumni who were currently working, in graduate school, or in post docs and other professional fellowships offered statements of their future career plans (n=24): 17 comments in this category (8 women, 9 men) discussed these alumni's intentions to pursue a science career pathway. In addition, three women and one man indicated they would pursue medicine. Another two mentioned going into non-science professions, and one mentioned using science in an "alternative" career path beyond graduation (all women). Of 24 comments, 21

(87%) discussed future career plans. **Thirteen women (54%) and eight men (33%) stated an intention to pursue a professional career pathway in science, including medicine, in the future.** In context, the number of observations in the "career plans" category is small. Nonetheless, these comments are evidence of alumni's ambitions for a science-related career.

- *Program evaluations* (n=384; 14% of women's responses, 13% of men's responses)

Another category of responses collected under general observations was alumni's program evaluations: positive, general/miscellaneous, and smaller numbers of negative and neutral evaluative observations. **Seventy-eight percent of alumni's comments were highly positive. Negative observations were only 3% of all evaluative program assessments.** Alumni's positive program evaluations consisted mostly of global evaluations that described program participation as a "really great" experience, as "the best experience" of alumni's lives, or the program, itself, as "amazing!" Most of participants' positive comments (29%) described the Marine Biology Seminar experience as "really great," as a highlight of their Carleton education, and as a fundamentally excellent life experience. A smaller number of responses (6%) mentioning that participation was "the best experience" described the outcomes of this program as, literally, "life-changing." A similar number of alumni observations (5%) offered the opinion that the program was "great," "amazing," or "awesome." Other responses comprising positive program evaluations were alumni comments describing the "most memorable experience" and elements of the program that students "liked," such as scuba diving, hiking, and camping. Participants offered few negative program evaluations. Two women mentioned both a "loss of belonging to community" and "loss of confidence to achieve academically" as a result of program participation. One woman said that her experience in a later internship confirmed for her that sexism in the field was still "rampant" and was one factor that pushed her away from pursuing a career in academe. However, one male also noted that his "negative interaction with professionals" deterred him from pursuing a career in marine biology. Given the majority of positive program evaluations, overall, these observations are testimony to the high quality of the Marine Biology Seminar.

- *How the Marine Biology Seminar generates gains* (n=352; 12% of both women's and men's responses.)

The number of alumni observations on program evaluations was balanced by a nearly equal number of observations discussing how the program produced the types of gains that participants reported. Just over half (51%) of these observations emphasized the opportunity of learning outside the classroom as a critical element in producing an in-depth learning experience. Some alumni observations described the impacts of interdisciplinary learning, and the contribution to learning through "immersion." In another set of related observations, alumni discussed how learning within an environmental context and encounters with the environment contributed to their learning experience, engaged interest, and encouraged greater awareness of ecological and environmental diversity (39% of observations on how gains were produced). Another 10% of participants' observations on the ways in which program benefits were generated described how working in the field provided them the hands-on experience necessary to asses how well research work matched their preconceived perceptions of it, and consequently, enabled them to clarify the suitability of their intended career goals. Alumni also said that direct experience with field work engendered a better understanding of potential career pathways and offered them the opportunity to explore different work roles within research.

Conclusions

Findings from the analysis of responses to five open-ended questions on a longitudinal alumni survey exploring outcomes of participation in the Marine Biology Seminar document strong impacts on participants' personal, intellectual and professional development, including effects on career choice and pathway, with a majority planning a career, pursuing a career, or working professionally in medicine or a science-related field. In addition, program goals aimed at encouraging students' choice of a professional pathway in the sciences, and in particular marine biology, appear to be substantiated by alumni's accounts of ways in which program participation influenced an increased interest in science, clarified and confirmed interest in their field of study, and promoted their choice of career pathway, including graduate study.

Almost half of participants' observations (44%) provided in describing the impacts of the Marine Biology Seminar reflect important learning gains. Alumni responses emphasized self-development as an outcome of program participation, including descriptions of how the experience of new places and cultures broadened participants' understanding of the world. Many alumni particularly emphasized a greater understanding of ecological and environmental diversity and macro-micro interconnectedness of Earths' complex biological systems. Many of alumni's observations support the conclusion that program objectives of imparting to participants an understanding and appreciation for the complexity of diverse ecological and environmental Earth systems is being met. Some participants' observations also described discovering lifelong passions, developing insights into themselves as individuals, and influences on their political and personal values in support of the environment. Overall, these gains show the importance respondents placed on the personal gains they took away from this program. Providing a holistic education that meets the needs of the "whole" student is a longstanding tenet of education that is still viewed as a central purpose of colleges and universities today (Dewey, 1933, 1938; Shor, 1987; Giroux, 1988; Freire, 1990; Boyer Report, 1998; Baxter Magolda, 1999, 2001, 2004).

Evidence of many of the learning gains associated with program participation (e.g., personal-professional development, gains in intellectual understanding of how science research is done, insight into professional practice and the adoption of professional attitudes and behaviors) are benefits that coincide with research documenting the beneficial outcomes of undergraduate research experiences and the processes whereby these gains are generated (Seymour, et al., 2004; Hunter, Laursen, and Seymour, 2006) and are consistent with national science education policy objectives promoted by relevant national funding organizations and institutions of higher education (Boyer Commission, 2002; National Science Foundation, 2000, 2003a; National Research Council, 1999, 2000, 2003a, 2003b).

Alumni observations on their career paths, their career intentions, academic degrees, and current professions show a focus in their professional development that was influenced by their experiences in the Marine Biology Seminar, with a small number of alumni (4%) providing comments stating that participation in the program had directly effected their career path decisions, including choice of major, field of study, graduate school and profession. Results of participants' persistence to graduate and other professional degree programs, along with reports of their current work in a science-related, medical or other professional field, demonstrate many program alumni's successful science career paths.

Highly positive program evaluations and descriptions of how program gains were generated through in-depth, experiential learning complement the many important, long-lasting benefits that alumni described in their written responses to this survey.

There were no discernable differences in the type or number of observations made by women vs. those offered by men responding to this survey Indeed, there is remarkable alignment in the balance of women's and men's observation in every category across the data set. Alumni's responses detailing gains from program participation were nearly half of all observations offered (44% of women's, and 45% of men's). Results concerning professional outcomes indicate similarly strong influences on women's and men's professional pathway and career choice. Women's and men's reports of having earned advanced academic degrees were nearly equal (43% and 48%, respectively). As well, taking into account that eight women (but no men) described their current work as a "stay-at-home mom," reports of alumni's current professions show similar percentages of women and men working in science-related careers, including medicine (57% and 69%, respectively). Sixty-seven percent of women and 87% of men responding to the survey reported going on to a graduate, medical or other professional degree program. These results are well above the national average for women (26%) and men (33%) reported by Sax (2001) as persisting to graduate school in SME degrees. The discernable gap between the number of women and men responding to this survey who went on to advanced study appears to be balanced (particularly in the longer term view of alumni career outcomes) by results showing that of the alumni who were currently working, in a graduate program, post doc or other professional fellowship, there was a higher percentage of women (54%) than men (33%) intending a science-related or medical career. Thus both women's and men's descriptions of their career development show equal ambition for, strong interest in, and achievement of, professional careers related to science and medicine. Overall, the many benefits which alumni described as outcomes of program participation were reported equally by the women and men responding to this survey.

Collectively, alumni observations on self-development, intellectual gains, personal-professional development of peer and professional collegiality, clarification and confirmation of career interests and strong influences on many participants' career pathways document powerful program outcomes. Findings from the qualitative analysis of the five-open ended questions included on the Off-Campus Studies program's longitudinal alumni survey demonstrate a breadth of important personal, intellectual and career outcomes resulting from program participation in the Marine Biology Seminar.