University of Puerto Rico, Río Piedras
College of Natural Sciences
Interdisciplinary Studies Program

Self-Study Report
2010-2020

Approved by the CNEI Self-Study Committee on Friday, September 16, 2022.

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Executive Summary

The Interdisciplinary Studies (CNEI in Spanish) program at the College of Natural Sciences (CNS) offers students the opportunity to design a curriculum that integrates different disciplines within and beyond the natural sciences. This allows students to create an undergraduate curriculum customized to their professional and personal goals. The program's curriculum aims to provide students with an interdisciplinary undergraduate experience integrating the state-of-the-art and in-depth scientific knowledge taught by professors in the different departments at the College with other disciplines on campus. The program's objectives are presented in a measurable form allowing both formative and summative evaluation.

The CNEI 2022 Self-Study Committee was composed by professors from the College of Natural Sciences representing the CNEI program and the departments of Biology, Physics, Mathematics, and administrative personnel from the CNEI program and the College Deanship offices. The committee began deliberations on the findings and recovered data in May 2022; this delay affected the availability of CNEI students to contribute as committee members. However, over the years the program has received students' recommendations through current student and alumni surveys, visits to the office or emails, and these suggestions and requests have been taken into account during internal program reviews. Data sources for the program's evaluation were the CNEI administrative office and the office of the Division of Institutional Research and Assessment (DIIA in Spanish) of the Deanship of Academic Affairs at the Río Piedras Campus. Meetings to discuss the data were held between May and June 2022. Deliberations included evidence ponderations and discussion of the CNEI degree's role within the College of Natural Sciences. The strengths and weaknesses of the program were also considered and recommendations were made.

Recovered data showed that the Natural Sciences Interdisciplinary Studies (CNEI in Spanish) program fulfilled its goals over the past 10 years. There was diversity and interdisciplinarity in the undergraduate curricula of the students enrolled in the Program, evidenced during academic advising sessions and graduate surveys. The curriculum of alumni degrees included courses required for continuing studies in careers related to human health, veterinary medicine, graduate studies in the natural sciences, careers in law, forensic anthropology and others. This, in turn, reflects the academic aptitude of the students in the program. This capacity was also demonstrated by the satisfactory approval (70% or more of those enrolled) of all the courses required by the CNS and of a selection of specialized courses in natural sciences that are frequently taken by CNEI students. In addition to academics, current students and alumni showcase the quality of their undergraduate training through their collaboration in research projects that, on occasion, allow them to present their work in different forums and even publish their work in peer-reviewed journals. It must be stressed, however, that these, in some instances far-reaching achievements, were done, and continue

to be done, by a handful of people committed to the program and its students, most of them on contract or additional compensation.

Among the strengths of the CNEI program are its high retention and graduation rates, the rigor in the training offered through the senior thesis (capstone) courses, the emphasis on strengthening quantitative and multi-methodological analysis skills without undermining the student's socio-humanistic training and opportunities for service. Regarding areas in need of improvement, the greatest urgency lies in recruiting teaching and non-teaching staff to help with the tasks required to maintain the excellence of the program and foster its continued development. Ideally, consideration should be given to how to retain current faculty. The performance of these professors as trainers of future scientific researchers has been of excellence and is the result of years of collaboration and teamwork that are not easily replicated.

The CNEI 2022 Self-Study Committee proposes the following recommendations to the College of Natural Sciences Dean:

- Create a committee for the revision of the CNEI undergraduate curriculum to incorporate the findings presented in this report and integrate those recommendations or innovations that are required.
- A minor change to the CNEI degree curriculum to alternate the current credit assignment to the Interdisciplinary Integration I and II (CNEI 4011-4012) courses. The recommendation is that two credits be assigned to CNEI 4011 and one credit to CNEI 4012.
- Inclusion of the senior thesis (capstone) project title as an annotation in the students' academic record.
- Support budget assignments for teaching and non-teaching resources that contribute to maintaining the CNEI program's operational efficiency.

In conclusion, the CNEI 2022 Self-Study Committee recognizes the value and contributions of the CNEI program to the College of Natural Sciences. Given the current reality in which scientists recognize that the unprecedented and urgent challenges facing modern society need an interdisciplinary approach combining natural sciences with social sciences, humanities and other disciplines, development of the Natural Sciences Interdisciplinary Studies Program should envision its key role in science education and training of future scientists and professionals.

Introduction, evaluation purpose and program background

Although there are academic programs with general sciences curricula in the UPR system, and other universities on the Island, the Natural Sciences-Interdisciplinary Studies (CNEI in Spanish) program offers students the opportunity of designing their undergraduate STEM studies in a personalized way, according to their interests and professional goals. In addition, as a degree requirement, students design, carry out and present an original scientific research project as a capstone requirement. This provides them with practical experiences that model the basic responsibilities needed for managing projects and that are an important part of the scientific endeavor. The first evaluation cycle of the Program was completed in 2005. The second cycle was completed in 2010. This report includes the self-assessment of the last five years of the program, 2016-2020. However, since there was no formal evaluation of the criteria during the period corresponding to the years 2011-2015, in those instances in which the data was available, they have been included in the present report.

The CNEI Self-Study Committee was established during the first semester of the 2021-2022 academic year under the coordination of the Associate Dean of Academic Affairs, Dr. Julia Vélez. However, Dr. Vélez was unable to continue with this assignment and delegated the task to the Associate Dean of Graduate Studies, Dr. Valentín Keyantuo, during the second semester of that academic year. The CNEI 2022 Self-Study Committee was composed by professors from the College of Natural Sciences representing the CNEI program (Dr. Elizabeth Dvorsky, Dr. Edwin Hernández and Dr. Gabriel Moreno) and the departments of Biology (Dr. Carmen Noemí Cintrón), Physics (Dr. Antonio Martínez), Mathematics (Dr. Luis Pericchi), and administrative personnel from the CNEI program (Mrs. Rosalía Cepeda) and the College Deanship (Dr. Valentín Keyantuo, also from the Mathematics department). Since there was a delay in receiving some campus data, the committee began deliberations on the findings during the month of May 2022. This affected student participation in the Committee. However, over the years the program has received students' recommendations through current student and alumni surveys, office visits and emails, and these suggestions and requests have been considered during internal program reviews. For the program evaluation process, data was provided by the CNEI administrative office and by the office of the Division of Institutional Research and Assessment (DIIA in Spanish) of the Deanship of Academic Affairs at the Río Piedras Campus. During the deliberation meetings, the recovered data was discussed as well as the CNEI program's role in the College of Natural Sciences. The strengths and weaknesses of the program were also considered and recommendations were made.

The CNEI program began in August 2007 as a result of a Campus-wide curricular revision of all undergraduate degrees at UPRRP. The present CNEI curriculum evolved from the prior General Sciences degree coordinated by the General Program in Natural Sciences (PGCN in Spanish). The PGCN office was also known as the "Pre-medical", and later "Allied Health",

office. The PGCN office mainly addressed the needs of students interested in pursuing professional studies in health areas, mostly medicine and pharmacy. The origin of the PGCN can be traced back to a time before the foundation of the College of Natural Sciences in 1943. At that time, medical schools did not require a completed bachelor's degree as an admission requirement. To be admitted, students had to approve at least 90 undergraduate ("pre-med") credits, which included courses at the College of Natural Sciences. Many times, after successfully passing the first year in medical school, there were those who applied for a General Sciences bachelor's degree through PGCN. Presently, students are required to have completed a bachelor's degree, including “pre-med” credits, for admission to medical schools. Pharmacy schools do not require a bachelor's degree for admission; however, students are always encouraged to complete their degree.

Through time, many revisions to the PGCN baccalaureate were done. However, the major revision culminated in the academic year 2006-2007 when the curriculum was redesigned to encourage interdisciplinary training in natural sciences. For the new curriculum in Natural Sciences-Interdisciplinary Studies, or CNEI in Spanish, core courses at the College of Natural Sciences were identified, a component of elective specialized courses at the College was created and the requirement of a capstone experience were included as part of the degree. The implementation of the CNEI baccalaureate began in August 2007. The name change of the program from “General” to “Interdisciplinary Studies” was completed in November 2009. The former Higher Education Council inactivated the baccalaureate in General Sciences, or PGCN, in that same year. Subsequently, the Registrar's office assigned the CNEI classification to the program's students. Since then, the CNEI degree has been a program with great demand and appreciation by students given its focus on the development of practical and professional skills, in addition to promoting specialized knowledge in their chosen disciplines, as evidenced in the student surveys available at https://natsci.uprrp.edu/picn/graduate-surveys/ .

As part of the implementation of the CNEI degree, the senior thesis, or capstone, courses, CNEI 4011-4012, were created in 2009. The first section of CNEI 4011, Interdisciplinary Integration I, was offered in January 2010. For the self-study period corresponding to the years 2016-2020 , there were 286 students who completed their capstone senior theses in the CNEI program. The capstone experience at CNEI has evolved over the past decade to become an exercise in creative expression where students apply quantitative or mixed-approach (quantitative and qualitative) research skills to study a real-world science issue. The capstone experience provides students with academic as well as professional training experiences, evidenced through CNEI 4012 course surveys and in alumni surveys where students highlight the importance of the capstone experience in their professional and personal training (https://natsci.uprrp.edu/picn/graduate-surveys/). The summary of the characteristics of the CNEI program is presented in Table 1.

Table 1

CNEI Program Characteristics Summary

Program name	Natural Sciences-Interdisciplinary Studies Program (CNEI, in Spanish)
Degrees awarded	Bachelor of Natural Sciences-Interdisciplinary Studies
Start date and duration	Start- August 2007 Duration- 4 years
Accreditations	n/a
Authorizations and license	
Program Administration	Director Administrative Secretary IV (1)
Last curriculum review	2010
Other program information	The CNEI curriculum is flexible and suitable for students who are interested in creating a personalized Bachelor's degree in natural sciences. The selection of specialized courses in science, mathematics and computer science, in addition to elective credits, allows them to design their own undergraduate curriculum for the degree according to their interests or professional goals. Oral and written communication skills are also emphasized, as well as the ethical development of scientific research practices.

SECTION I: FINDINGS BY EVALUATED AREA

I. Mission, goals and objectives

The mission, goal and objectives of the baccalaureate program in Natural Sciences - Interdisciplinary Studies (CNEI in Spanish) are presented in Table 2.

Table 2

Mission, goals and objectives of the CNEI program

Mission
The mission of the *Natural Sciences-Interdisciplinary Studies (CNEI)* program is to offer an interdisciplinary academic preparation of excellence, with extensive training in natural sciences, mathematics and computer science, promoting mastery in the application of scientific methodologies and the integration of computing skills for the development of effective communication skills. The flexibility of the curriculum allows students to create a baccalaureate according to their interests and professional goals. The selection of the College's courses and electives, together with individualized counseling, enables our alumni to pursue graduate studies, obtain admission to professional schools or enter the workforce.

	Goals	Objectives
1	Promote the achievement of university levels in oral and written communication skills in both English and Spanish.	1. The student will develop oral and written expression skills in both languages. 2. The Program will provide guidance to students regarding appropriate English and Spanish courses to strengthen written and oral communication skills.
2	Develop skills in the use of technology as a means of communication and research.	1. The student will employ technological tools in the elaboration of documents and presentations. 2. The student will use technological resources as a means to collect information relevant to a research project.
3	Provide a solid foundation in science, mathematics, and computer science that, integrated with other disciplines, will allow students to develop their baccalaureate according to personal interests and professional goals.	1. During their first two to three years of study, students will acquire basic knowledge in science, mathematics, and computer science. 2. The Program will provide guidance for students to complete a curricular sequence of courses in science, mathematics, computer science and free electives consistent with their professional goals. 3. Upon completion of the degree, students will be able to pursue graduate or professional studies, or obtain employment in their area of interest, integrating their interdisciplinary training.
4	Promote the development of responsible citizens committed to the Puerto Rican society.	1. The Program will promote student participation in community service and social interest activities either through service in student organizations or in their personal capacity.
5	Provide an alternative to students classified in different departments at the College of Natural Sciences and the Campus to obtain a bachelor's degree in science.	1. The Program will provide guidance to students classified in other departments at the College of Natural Sciences and the Campus on graduation requirements through the CNEI program.

2. The Program will contribute to strengthening the retention and graduation rates at the College of Natural Sciences.

The mission, goals and objectives of the CNEI program were reviewed during the second evaluation cycle in 2010. At that time, the evaluation committee redefined these components to facilitate the definition of specific identifiers that would allow objective assessment of the program's contribution to student's knowledge, skills and capabilities. Program goals and objectives focus on student learning; this is evidenced by the emphasis on strengthening of oral and written communication skills in English and Spanish, the development of skills related to the use of technology as a tool in communication and research, and in the comprehensive training of students with workforce-related skills. The dissemination of the goals and objectives is done through the electronic page of the CNEI program (https://natsci.uprrp.edu/picn/).

In summary, data for the last 10 years show that the CNEI program has been effective in achieving its goals and objectives. This conclusion is sustained through the data presented in Table 3.

Table 3

Achievement evidence for CNEI program goals

Goal	Achievement evidence
Promote the achievement of university levels in oral and written communication skills in both English and Spanish.	● The classification of most incoming students at intermediate and honors levels in Spanish and at basic and intermediate levels in English suggests that they are proficient in both languages. Additionally, all students are encouraged to enroll in writing courses in Spanish (ESPA 3208 Redacción y Estilo) and in English (INGL 3236 Scientific Writing) as part of their preparation for the capstone experience. Similarly, public speaking courses are recommended for those who want to strengthen their oral communication in any of the languages. ● The annual student learning assessment reports show the achievement of this goal by the students in the CNEI senior thesis courses (capstone, CNEI 4011-4012).
Develop skills in the use of technology as a means of communication and research.	● The evaluation rubric of the proposal and the CNEI senior thesis include these competencies. The annual student learning assessment reports show the achievement of this goal by the students.

Goal	Achievement evidence
Provide a solid foundation in science, mathematics, and computer science that, integrated with other disciplines, will allow students to develop their baccalaureate according to personal interests and professional goals.	● The approval rates in the basic natural science courses required by the College, as well as in some specialized courses representative of student preferences, are at least 70% or more of those enrolled. It is estimated that this approval rate is close to the rate for students in the baccalaureate in specific disciplines in the College. ● In a survey administered to current students of the CNEI program during the 2020-2021 second semester (response rate-47%), the professional goals mentioned were Medicine (65%), Graduate Studies (12%), Pharmacy (9%), Dental Medicine (7%), MD/PhD (2%), Public Health (2%), Physical Therapy (1%), Optometry (1%), and Nuclear Medicine (1%). ● In the surveys carried out between the years 2014-2020, it is evident that 60% of CNEI alumni continued studying, 14% work and 11% do both after completing their degree. This supports the achievement of the goal in terms of the academic training necessary to pursue their interests and professional goals given that they meet the required skills and knowledge.
Promote the development of responsible citizens committed to Puerto Rican society.	● During academic advising, many students have expressed their participation in some of the CNS student associations, where they participate in training workshops and community service. They mostly report belonging to the undergraduate chapter of the *American Medical Student Association* (AMSA), *Med-life* and *Future Pharmacists Association* (FPA). It is noteworthy to mention that the latter organization was founded by two CNEI alumni during their sophomore year.
Provide an alternative to students classified in different departments of the College of Natural Sciences and the Campus to obtain a bachelor's degree in science.	● There was an average of 8 reclassifications, 4 transfers, and 2 transfers per year from 2016 to 2020.

The mission of the CNEI program is also aligned with those for the Campus and the College of Natural Sciences. This lineup is described in Table 4.

Table 4

Alignment between the Mission of the Campus, the College of Natural Sciences and the CNEI Program.

Río Piedras Campus Mission	Mission of the College of Natural Sciences	Mission of the Natural Sciences-Interdisciplinary Studies (CNEI) Program
The *Campus* has as its mission: 1. Promote the comprehensive education of students through study programs that promote: intellectual curiosity, critical capacity, continuous learning, effective communication,	The mission of the *College of Natural Sciences* is the intellectual and humanistic training of professionals in various areas of scientific work. An integral part of	The mission of the *Natural Sciences-Interdisciplinary Studies (CNEI)* program is to offer an interdisciplinary academic preparation of excellence, with extensive training in natural

Río Piedras Campus Mission	Mission of the College of Natural Sciences	Mission of the Natural Sciences-Interdisciplinary Studies (CNEI) Program
appreciation and cultivation of ethical and aesthetic values, participation in Campus processes, as well as reflection and social responsibility. 2. Provide graduate education of the highest quality with research and creation as core elements, and help strengthen undergraduate education. In addition, provide post-baccalaureate programs for the training of professionals of the highest caliber, committed to the ideals and values of Puerto Rican society. 3. Provide undergraduate education of excellence that offers a comprehensive vision of knowledge. This must harmonize general education and specialized training, and develop capacities for independent study and research. 4. Develop teaching, research and service and integration to the community in accordance with the historical-social reality of Puerto Rico, in harmony with its Caribbean and Latin American environment, and projecting itself to the international community. The wealth of knowledge relevant to the consolidation of the Puerto Rican nationality, its history, language, and culture will be enriched and strengthened. The development and dissemination of knowledge at the international level will also be encouraged. 5. Develop innovative and pertinent research, community service, and continuing education programs that respond to and contribute to the academic and professional activities of the Campus. They must also contribute to the transformation and continuous progress of Puerto Rican society, to the analysis and formulation of solutions for the socioeconomic and political problems of the country, and to the improvement of the quality of life.	this mission is the search for the truth through research and thus contribute solutions to the problems that affect humanity.	sciences, mathematics and computer science, promoting mastery in the application of scientific methodologies and the integration of computing skills for the development of effective communication skills. The flexibility of the curriculum allows students to create a baccalaureate according to their interests and professional goals. The selection of the College's courses and electives, together with individualized counseling, enables our alumni to pursue graduate studies, obtain admission to professional schools or enter the workforce.

The CNEI program alumni profile did not change during the second evaluation cycle in 2010. The 2021 Self-Study Committee ratifies the current profile. The distribution of the CNEI graduate profile indicators according to Knowledge, Skills, and Attitudes and Values criteria is presented in Table 5.

Table 5

Competency Distribution of the CNEI Program Graduate Profile

A. Knowledge
Alumni will be able to: ● Integrate their knowledge in Science and Mathematics to solve problems in their daily work and in our society. ● Demonstrate knowledge in the use and application of technologies in the search for information, its analysis and incorporation into their own knowledge base. ● Establish connections between scientific knowledge and other disciplines such as the humanities, the arts, and the social sciences, among others, relevant to their goal of study or work.
b. Abilities
Alumni will be able to: ● Demonstrate effective communication in Spanish and English, in both oral and written form. ● Be qualified to pursue graduate studies in the specialized field of their interest or in professional schools.
c. Attitudes and Values
Alumni will be able to: ● Make decisions based on systematic, critical and ethical analysis both in their profession and daily life.

II. Need and relevance of the program

The degree offered through the CNEI program adjusts to the needs of those students who are not satisfied with the curricular sequences of the specialized departments and are interested in designing a novel curriculum (Appendix 1). The curriculum of the CNEI program foments an exhaustive study of different specialties in natural sciences, complemented by integrating disciplines in other fields of knowledge through their elective courses. For example, the high prevalence of health profession-oriented students in the CNEI population is known. The agility of the Program's curriculum allows them to meet the requirements of specialized courses in biology and chemistry, for example, in addition to courses in the social sciences, humanities or the Spanish and English languages chosen as elective courses. Information about ways to build their baccalaureate by integrating courses offered in other campus colleges is offered to CNEI program students beginning in their freshman orientation and in academic advising sessions throughout their degree. This allows students to customize their undergraduate curriculum to meet the requirements for admission to their chosen graduate or professional schools. They are also encouraged to register courses that include experiences that strengthen important workforce skills such as oral and written

communication in Spanish and English, and to also include participation in research programs, summer internships or coop experiences as part of their undergraduate training. In recent years, the relevance of data management and statistical analysis as important academic and workforce skills has been emphasized. These skills also contribute to strengthening students' ability to think analytically and critically during problem solving and project management. The skills described above are also reinforced throughout the capstone year.

Given the flexibility of the CNEI curriculum, the Program does not require a large number of its own courses. However, CNEI-coded courses are an important part of students' academic growth given their unique function in integrating natural sciences with approaches and knowledge from social sciences, humanities and other disciplines to address the many great challenges of our society and provide genuine solutions. This integration of disciplines has become an important emerging trend in science. It is currently being recognized that the urgent challenges facing today's society (and which science itself addresses) such as health, the climate crisis, energy, sustainability, automation, water and food availability, etc. cannot be solved by science alone but require an interdisciplinary approach. *Nature*, one of the two most prestigious scientific journals in the world, dedicates an entire issue, titled *Interdisciplinarity*, to this matter (Vol. 525, 2015 Special Issue, https://www.nature.com/nature/volumes/525/issues/7569). This view is also reflected in academic programs in other prestigious universities. For example, Harvard's program in Science, Technology and Society states in its website that "specialization in today's research universities does not fully prepare future citizens to respond knowledgeably and reflectively to the most important challenges of the contemporary world. Increasingly, the dilemmas that confront people…cut across the conventional lines of academic training and thought. [This program] seeks to overcome these divisions, particularly between the two cultures of humanities (interpretive inquiry) and natural sciences (rational analysis)." Courses offered by other Faculties outside Natural Sciences do not fulfill this important function of integrating their approaches and knowledge to science. Rather, they are parts of a fragmented education that offers specialized knowledge in particular unconnected areas. Hence students have difficulty understanding how this knowledge is related and can be useful to science, as they themselves point out. The elective courses of the Natural Sciences Interdisciplinary Program address this need, an issue that the aforementioned publication flags as critically needed for the education and training of scientists today. In this way, CNEI program elective courses offer valuable knowledge for students' professional future within the reality of 21st century science. They also help provide any student (both science and non-science majors) with the tools and knowledge enabling them to act as engaged citizens committed to the betterment of our society basing their knowledge, ideas and actions on science.

In addition to CNEI courses, students can integrate courses from other departments at the College of Natural Sciences as science specialty electives. CNEI students are also provided

with individualized academic advising to guide them in integrating natural sciences with other disciplines such as social sciences and humanities, and for strengthening their professional skills. However, the reliance on courses from other departments at the College, for example specialized and research courses, is a virtue and at the same time a disadvantage of the program since it generates an additional demand for spaces in these departments. The challenge to obtain spaces in some high-demand courses at the College, such as those in the Biology department, has been commented on by some students in the alumni surveys (https://natsci.uprrp.edu/picn/graduate-surveys /). The problem is also aggravated by budget cuts for departments as it limits the number of course sections they can offer and forces them to give priority to students from their respective degrees. However, this difficulty has not been an impediment for students to complete the CNEI baccalaureate. Specifically, for the courses that are required for admission to medical schools, pharmacy, and other health-related careers, there have been no complaints from students prevented from entering their program of interest due to difficulties in course enrollment. This may be due, in part, to the fact that the CNEI program is small, by design, precisely to effectively meet the needs of students and College departments without overloading resources.

SECTION II EFFECTIVENESS OF THE PROGRAM

II. Students

A. Registration

Table 6 summarizes the data on the number of applicants and first alternative selections to the CNEI program as well as the number of students who finally enrolled. Prior to 2017, when the Island was struck by two hurricanes, Irma and María, emigration rates from Puerto Rico to the United States had been increasing due to local economic and social challenges. As a result, there has been a steady decrease in the population impacting all academic levels, including higher education, in public and private institutions. Still, the CNEI program has been able to fill its yearly admission quota during the past 5 years. One reason for this accomplishment relates to the program's small size; the established freshmen quota for the past 5 years has been 50 students. These small cohort sizes are due to the limitation in assigned teaching and administrative staff. There is one permanent professor ascribed to the program and one permanent professor, the interim director, on special appointment from the College of General Studies. In addition, teaching personnel recruitment for the senior thesis (capstone) course sections is difficult. The capstone experience is carried out through a one-year course where students are trained in basic research design skills, data collection and management, statistical analysis, critical thinking and project management, among other practical skills. Consequently, the task of training students and supervising senior thesis requires trained personnel to teach these skills, but who are also willing to supervise projects not necessarily related to their field of specialization. In turn, the latter limits the quota in the capstone sections. It is not realistic to expect professors to supervise more than 15 different senior thesis a year, in addition to other teaching and research tasks. This situation reaffirms the recommendation to hire more staff, both teaching and non-teaching, for the

CNEI program. Finally, an additional reason that limits program spaces is the precaution of not overloading the resources at the College of Natural Sciences. The CNEI program depends on the courses in other departments at the College. If too many students are accepted, there is a risk of not being able to offer them space in courses that they may want to register for from these departments.

A.1 Admissions

Table 6

Relationship between the Quota, Number of Applicants (1st alternative), Admitted (1st alternative) and Enrolled in the CNEI program.

Years	Quota	Applicants (1st alternative)	admitted (1st alternative)	Enrolled
2015	50	183	77	66
2016	50	125	53	49
2017	50	42	28	41
2018	50	37	30	59
2019	50	39	35	51
2020	50	39	25	53

Tables 7-10 provide data regarding Transfers, Readmissions and Reclassifications to the CNEI program during the past five years. The data shows that transfers and readmissions do not contribute many students annually to the program. The effect on the total student population of these administrative processes in CNEI is estimated to be similar to that in other departments of the College. Reclassifications, however, represent the largest source of students into the program but are still limited by space. The strategy to address the issue of limited space in the CNEI program has been to try to maintain groups of approximately 75 students per academic year of classification (first, second, third, etc.) since this allows anticipating the estimated number of students that would be requiring a space in the sections of the first senior thesis course, CNEI 4011 during their fourth or fifth year. This implies that under current conditions and resources , the total number of students that can be effectively managed by the program should not exceed 375 individuals between years 1-5. However, it should be noted that this does not mean that the quota for freshmen students is 75 because it is necessary to reserve spaces for student reclassifications in subsequent years of study.

A.2 Local transfers (from other local colleges)

Table 7

Relationship between the Number of Applicants, Admitted and Enrolled by Local Transfer.

Years	Applicants	Admitted	Enrolled
2016	16	6	6
2017	11	3	3
2018	12	12	0
2019	8	4	4
2020	9	3	3

A.3 External transfers (from outside Puerto Rico)

Table 8

Relationship between the Number of Applicants, Admitted and Enrolled by External Transfer.

Years	Applicants	Admitted	Enrolled
2016	4	2	2
2017	6	3	3
2018	3	2	2
2019	5	3	2
2020	2	1	1

A.4 Readmissions

Table 9

Relationship between the Number of Applicants, Admitted and Enrolled through Readmission.

Years	Applicants	admitted	Enrolled
2016	8	5	4
2017	3	2	2
2018	6	5	4
2019	2	2	2
2020	7	7	6

A.5 Reclassifications

Table 10

Relationship between the Number of Applicants, Admitted and Enrolled through Reclassification.

Years	Applicants	admitted	Enrolled
2016	27	12	12
2017	26	11	11
2018	15	3	3
2019	10	6	6
2020	2	1	1

A.6 Total Enrollment

The distribution of total student enrollment by semester is summarized in Table 11. As indicated above, the total population of the program is deliberately kept small in order to maximize the resources available for providing services to students, in addition to the need to try to ensure space in the senior thesis (capstone) course for all students in their last year of studies. If the possibility arises to increase the available resources, the student population could be increased to respond to the high demand for the program, particularly during the reclassification period.

Table 11

Distribution of total enrollment per semester.

Academic year	Semester 1	Semester 2
2015	354	354
2016	351	367
2017	320	294
2018	280	250
2019	246	241
2020	248	244

Regarding the distribution by gender, during the years 2015-2020 a bias was observed in favor of the presence of females in the population, evidenced by the data in Table 12.

Table 12

Distribution of the student population of the CNEI program by gender.

Year	Total			Classification Year																	
				1st year			2nd year			3rd year			4th year			Transient			OTHER		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
2015	127	227	**354**	29	42	71	26	46	72	17	50	67	48	86	134	5	2	7	2	1	3
2016	118	233	**351**	15	36	51	32	41	73	24	48	72	43	106	149	4	2	6	-	-	0
2017	106	214	**320**	11	35	46	17	32	49	31	45	76	45	101	146	1	-	1	1	1	2
2018	94	186	**280**	20	41	61	12	33	45	13	24	37	47	83	130	1	1	2	1	4	5
2019	77	169	**246**	22	35	57	18	43	61	12	33	45	25	54	79		3	3	0	1	1
2020	80	168	**248**	16	44	60	21	34	55	18	36	54	24	54	78	1	-	1	-	-	0

A.7 Degrees conferred

Between the years 2014-2020, there was an average of 58 degrees conferred annually in the CNEI baccalaureate program (Table 13). However, in the 2019-2020 academic year there were 33 degrees conferred, which represents a lower amount than previous years. These lower numbers could be influenced by setbacks and difficulties due to the COVID-19 pandemic. Nonetheless, considering that the admission quota for those years was 50 students, we can conclude that the program was effective in graduating its students.

Table 13

Degrees conferred per academic year and distribution by gender.

Year	Total	Female	Male
2014-2015	62	37	25
2015-2016	70	25	45
2016-2017	60	47	13
2017-2018	75	47	28
2018-2019	48	37	11
2019-2020	33	19	14

Similarly, average CNEI program 6-year graduation rates was found to be 65% for data from 2014 to 2020. This value is higher than the average for the Río Piedras Campus for the same period, which was 54%. The degrees conferred by academic year are summarized in Table 14.

Table 14

Degrees conferred by the CNEI program.

Year	6-year Graduation Rate (%)
2014-2015	67
2015-2016	69
2016-2017	68
2017-2018	66
2018-2019	65
2019-2020	61
2020-2021	65

In summary, the program is effective in achieving the quota for new admissions. Also, an average graduation rate of approximately two thirds of the admitted students was achieved. The decade evaluated for the CNEI program (2010-2020) was one of great challenges for the institution. It was a period where budget cuts and job freezes were faced, in addition to two student strikes and several natural disaster events, in particular the passage of Hurricane Maria which was particularly catastrophic. Consequently, there was an additional factor influencing the already dramatic population reduction on the Island. In particular, emigration of families with children and youths has affected all educational levels. Along with these factors, there is the CNEI program's adoption of administrative measures to deliberately control its student population size. The foregoing responds to the need to ensure student services and the limitation of spaces in the capstone course sections, the latter being one of the main factors guiding student population size regulation measures. These management strategies could also be an important factor influencing the Program's high retention rates and success. The 2022 CNEI Self Study Committee recommends continuation of the strategies used in recent years to maintain these results.

B. Learning Assessment

Over the past 10 years, student learning assessment in the CNEI program has included *Research and Creation, Critical Thinking, Logical-Mathematical Thinking, Discipline Content, Effective Communication, Information Competencies, Social Responsibility, Capacity for Independent Study,* and *Lifelong Learning,* which are the domains chosen by the Río Piedras Campus. Data for each evaluated domain is presented in Appendix 2. All in all, the indicators selected for each domain have been met; however, most of the findings are grouped in the second and third evaluation instances given that the indicators correspond to data from the senior thesis (capstone, CNEI 4011-4012) courses. Data collection for the first evaluation instance has historically been the most challenging for the program since most of the freshmen courses belong to different departments at the College of Natural Sciences. As an aggravating circumstance, the lack of personnel to manage the data collected in the departments makes it difficult for them to segregate the information obtained in basic

courses such as General Biology 2 (BIOL 3102), General Chemistry 1 (QUIM 3001) or the Department of Mathematics courses, which are assigned to most freshmen students. Regarding the second and third evaluation instances, the objectives for all domains have been met. The foregoing is to be expected given that during the past 11 years, the sections of the senior thesis (capstone, CNEI 4011-4012) course have been under continuous review and the recommended transformative actions have been implemented over this time.

Tables 15-17 show the approval rates for some courses in the CNEI degree. Data for Spanish and English courses, College of Natural Sciences required classes, and some specialized courses at the College that are frequently registered by CNEI students is presented. It should be noted that for the computations of the approval rate, any course in which the students have obtained a grade of C or higher was considered as “Passed”; this differs from the criteria of the Registrar's office that considers grades of “D” as the lowest grade to pass many courses. Therefore the “official” passing rate could be underestimated. As for courses with a "P" (Pass) grade, these could also include "D" grades, which would also introduce a source of error in the computations as defined here. Also, W, W*, F* grades were not excluded from the total registered student numbers, adding an additional source of error.

Table 15

CNEI Student Pass Rates and Levels of Spanish and English Courses in the last three years

Spanish and English Courses (Level)	Enrolled students 2017-2018		Enrolled students 2018-2019		Enrolled students 2019-2020	
	Total enrolled	Pass rate (%)	Total enrolled	Pass rate (%)	Total enrolled	Pass rate (%)
ESPA 3003 (Basic)	1	**100**	0	**0**	0	**0**
ESPA 3004 (Basic)	1	**100**	0	**0**	0	**0**
ESPA 3101 (Regular)	15	**87**	27	**93**	49	**96**
ESPA 3102 (Regular)	15	**93**	28	**100**	42	**98**
ESPA 3111 (Honors)	17	**94**	13	**100**	14	**93**
ESPA 3112 (Honors)	15	**87**	14	**86**	10	**100**
ENGL 3101 (Regular)	10	**90**	27	**96**	31	**100**
ENGL 3102 (Regular)	3	**67**	24	**96**	36	**100**
ENGL 3103 (Intermediate)	16	**94**	16	**94**	4	**100**
ENGL 3104 (Intermediate)	0	**0**	17	**82**	14	**100**
ENGL 3011 (Honors)	3	**67**	4	**100**	4	**75**
ENGL 3012 (Honors)	2	**100**	3	**100**	2	**100**

Data show some differences in basic skills in the Spanish and English languages of the students admitted to the CNEI degree in the past 3 years. Spanish proficiency in these groups mostly ranged between the “Regular” and “Honors” levels, suggesting a relatively good command of the language. However, for these years there was a greater distribution of

students in the “Regular” and “Intermediate” levels for the English language and very few students in the “Honors” levels. This observation does not necessarily suggest a poor command of the English language, which is very important in the natural sciences, but it could suggest the desirability of reinforcing these language skills. During academic advising, students are provided information regarding English and Spanish courses they can register to strengthen their oral and written communication skills. This is particularly helpful for their capstone year since they are continually writing reports, as well as their research proposal and senior thesis, or communicating orally.

On the other hand, the analysis of the *Knowledge in the discipline* domain can be measured indirectly by evaluating CNEI students’ passing rates for their basic courses at the College of Natural Sciences. Table 16 describes the approval rates of the required core courses.

Table 16

Approval Rates Courses Required by the College in the last three years

courses	Enrolled students 2017-2018		Enrolled students 2018-2019		Enrolled students 2019-2020	
	Total enrolled	Pass rate (%)	Total enrolled	Pass rate (%)	Total enrolled	Pass rate (%)
BIOL 3101 (General)	45	**98**	3. 4	**97**	57	**96**
BIOL 3102	50	**92**	63	**86**	59	**92**
BIOL 3349 (Genetics)	73	**77**	52	**83**	24	**83**
QUIIM 3001 (General)	55	**82**	50	**72**	60	**73**
CHIM 3002	10	**90**	42	**83**	48	**88**
FISI 3011 (General)	54	**80**	58	**72**	52	**83**
FISI 3012	52	**77**	43	**86**	44	**91**
FISI 3013 (General Lab)	43	**95**	39	**95**	42	**98**
FISI 3014 (General Lab)	49	**96**	38	**100**	38	**100**
CINA 3005 (Intro Cs.Amb.)	33	**97**	55	**96**	37	**97**
MATE 3151 (Calculus 1)	50	**85**	28	**79**	49	**88**
MATE 3026 (Statistics)	53	**92**	29	**97**	38	**100**

In general, no major difficulties have been detected in approval rates for the required courses in the College of Natural Sciences for the past three years. For all courses, student approval rates exceed 70% of those enrolled.

Given that the CNEI baccalaureate gives students the flexibility to choose 24 credits in specialized courses in natural sciences, the list of possible options would consist of a large part of the academic offer at the College. For this reason, students are oriented on specialized courses during academic advising sessions and they can also access information through the Program's website (https://natsci.uprrp.edu/picn/bachelor-of-science-interdisciplinary- studies/). However, it is known that many students in the program aspire to pursue, at least initially, a career in health, especially medicine. For this reason, as a complement to the data for the domain of *Knowledge in the discipline*, some specialized courses at the College of Natural Sciences that are in high demand by CNEI Program students have been chosen as indirect measures for the assessment. The passing rates by students in the last three years (2017-2020) for the specialized courses in natural sciences chosen for this report are presented in Table 17. In the case of these specialized elective courses, grades of C or higher are required to be considered "Passed". This requirement is described in the Program flyer and on the website. Grades with values of W, W*, F*, or P were not excluded from the computation.

Table 17

Pass Rates Specialized Courses Commonly Taken in the Past Three Years

courses	Enrolled students 2017-2018		Enrolled students 2018-2019		Enrolled students 2019-2020	
	Total enrolled	Pass rate (%)	Total enrolled	Pass rate (%)	Total enrolled	Pass rate (%)
QUIM 3031 (Org.Chem. 1)	68	**82**	58	**88**	42	**86**
QUIM 3032 (Org.Chem. 2)	50	**86**	46	**70**	44	**91**
QUIM 4055 (Biochem.)	16	**88**	12	**92**	7	**71**
BIOL 4545 (Biochem.)	47	**85**	34	**85**	37	**97**
BIOL 4345 (Biocel.)	16	**94**	8	**100**	6	**83**
BIOL 3711 (Human biol 1)	66	**95**	39	**90**	28	**100**
BIOL 3712 (Human biol 2)	44	**98**	16	**81**	21	**100**
BIOL 3705 (Micro.)	37	**76**	49	**86**	35	**89**

As in the basic courses at the College, CNEI students do not present major difficulties in passing the specialized courses used as indicators. Pass rates for the selected courses consisted of 70% or more of the enrolled students in all cases.

Finally, enrollment data in CNS research courses are also included as an indirect measure for the *Research and Creation* domain. CNEI students tend to prefer the BIOL 4990 course more

than research courses in Chemistry, Environmental Sciences, or other departments. Those that have registered research credits from departments other than Biology have passed the courses. The number of students enrolled in BIOL 4990 in relation to the total enrollment in the course is presented in Table 18. For the 2017-2018 academic year, CNEI students represented approximately 17% of the total number of students enrolled in the course. This percentage is reduced in the years 2018-2019 and 2019-2020 to represent 11 and 10%, respectively. This reduction could be due to the aftermath of hurricanes Irma and María, student strikes and the COVID-19 pandemic.

Table 18

Number of CNEI students enrolled in BIOL 4990 in the last three years.

2017-2018			2018-2019			2019-2020		
Total CNEI students enrolled	Total enrolled	% CNEI students	Total CNEI students enrolled	Total enrolled	% CNEI students	Total CNEI students enrolled	Total enrolled	% CNEI students
174	1,008	17	109	1,021	11	98	945	10

To diversify the resources for CNEI student learning assessment of some Campus domains, during the 2021-2022 academic year, evaluation of teaching modules available on the website of the College of Natural Sciences (http:/ /www.bcn.uprrp.edu/literacy/courses_spanish.html) as data sources is underway. Specifically, modules have been identified that allow assessment of the *Research and Creation, Effective Communication* and *Information Competencies* domains. Some modules may be repeated across domains. Student scores on these exercises would not be required as part of course evaluations, their function is only as an assessment measure. It is at the discretion of the professors to compensate for or not student participation in these modules. The distribution of recommended modules according to the identified learning assessment domains are as follows:

Research and Creation

- Scientific method
- How to search on the Internet
- How to locate and identify research articles
- Use of the online catalog
- *Science Direct* database
- How to evaluate localized information
- Location of primary and secondary sources
- How to prepare oral reports
- How to prepare a Poster

Effective Communication

- How to prepare oral reports
- How to prepare a Poster

Information Competencies

- How to search on the Internet
- How to locate and identify research articles

- Use of the online catalog
- *Science Direct* database
- How to evaluate localized information
- Location of primary and secondary sources

In summary, in the 2010-2020 decade there were diverse data sources for assessment of CNEI program student learning. Indicators are fairly consistent for the second and third instance evaluations. However, the data recovered for this self-study period suggest variability in the achievement of objectives for the first learning assessment evaluation instance. There is a consistent problem in obtaining assessment data for freshmen populations, therefore there is a tendency for the inclusion of results obtained from non-recurring assessment activities. For example, in a section of the Introduction to Environmental Sciences (CINA 3005) course offered in the 2020-2021 academic year, assessment activities for the domains of *Research and Creation, Logical-Mathematical Thinking, Content of the Discipline,* and *Effective Communication* were carried out. However, even when the collected data was useful, it corresponds to the activities carried out in a single section of the course, so it is not a representative sample of that freshman population. The increase in the sample size for this group would depend on the willingness of other professors in the course to adopt the activities developed for the section used as reference. Similarly, it would be advisable to create assessment activities in other CNS freshmen basic courses, ideally with common evaluation instruments, to improve first year measures at the program, department and College levels.

The difficulty in obtaining appraisal data for the first learning assessment instance is a common problem with other departments at the CNS. As a transformative action to address this issue, the identification of recurring activities is proposed and, ideally, the creation of common assessment instruments. It should be noted that this would require hiring personnel for data organization and analysis. Unfortunately, these initiatives can only materialize if there are resources in the College to support academic research, an endeavor made difficult by the current budget crisis. Even so, it is imperative to emphasize the need for assistance in data management to carry out a large part of the tasks required to achieve the proposed transformative actions. New hires with expertise in database management are needed, even if it is as part-time contracts, to organize and analyze the data collected through common institutional learning assessment instruments. In this way, the task of the College learning assessment coordinator is supported since they receive the information collected in the programs and departments and must integrate all into a single report. Another advantage of assigning a competent individual to this position is that a highly useful academic database can be generated and maintained for future studies and program accreditations.

C. Retention

The retention rates for the CNEI program are summarized in Table 19. The CNEI program is characterized by high student retention rates. The average retention at the second year for the 2015-2019 cohorts was 90%. Furthermore, the graduation rates by cohort accordingly reflect this high retention given that about two thirds of admitted students complete their degree. Therefore, supporting and maintaining current program practices is recommended.

Table 19

Degrees conferred per year and distribution by gender.

Year	Cohort	Retention rate at 2nd year (%)
2015-2016	2015	95
2016-2017	2016	95
2017-2018	2017	84
2018-2019	2018	86
2019-2020	2019	88

Both institutional statistics and student surveys show the success of the CNEI program and its students. It is important to at least maintain the current conditions and strategies so that the program's students continue to receive the services and opportunities that make the CNEI degree stand out.

II. Staff

The CNEI program has very few teaching staff. It consists of a permanent professor affiliated to the program and the interim director, who is a permanent member but is on special appointment from the College of General Studies. The teaching tasks in the CNEI program focus on student training and the supervision of the required senior thesis, or capstone project. This task is carried out by the director, a permanent faculty member, a full-time contract professor and three professors with an assigned additional compensation. The task of capstone project supervision is monumental; each professor is tasked with a group of approximately 15 students, all with different project topics, and research and communication skills. It is precisely because of the amount of work required to supervise the capstone courses that makes it difficult to recruit permanent teaching staff to teach them. One of the fundamental needs for the academic functioning of the CNEI program is to maintain the current professors since they have been trained for many years in the educational philosophy for teaching and training CNEI students. The effectiveness of this training could be seen in the year 2018 when no statistically significant difference was found in student performance between course sections. This suggests that, in addition to the expertise and mentoring by the supervising researchers of the projects, the professors use the educational strategies available for the course in a comparable and effective way. Furthermore, these results help validate the effectiveness of the curriculum designed for

these courses. The diversity in the training of permanent teachers or those affiliated with the program through special appointment or compensation is summarized in Tables 20-22.

Table 20

Diversity in Teacher Training: Regular Teachers

Regular Teachers	University of the Highest Degree	Graduation Year	University Country
Dr. Gabriel Moreno* (Associate Professor)	State University of New York at Stony Brook	1990	USA
Dr. Elizabeth Dvorsky (Professor, Interim Director, January 2008- present)	University of Puerto Rico-Río Piedras	1996	Puerto Rico

* Dr. Moreno has postdoctoral studies in the Social Study of Science from Cambridge University (1990-92) and Harvard University (1994-98).

Table 21

Diversity in Teacher Training: Full-Task Contract Teachers

Full Task Contract Teachers	University of the Highest Degree	Graduation Year	University Country
Dr. Edwin Hernandez	University of Puerto Rico-Río Piedras	2000	Puerto Rico

Table 22

Diversity in Teacher Education: Capstone Course (Additional Compensation)

Professors by Compensation	University of the Highest Degree	Graduation Year	University Country
Dr. Victor Orbegoso	University of Puerto Rico-Río Piedras	2006	Puerto Rico
Dr. Javier Alvarez	Texas State University	1997	USA
Dr. Omar Perez	Utah State University	2014	USA

The publications, presentations and creative work of regular teachers and staff by special appointment is broken down in Appendix 2. Table 23 summarizes this creative work for regular teachers.

Table 23

Publications, Presentations and Creative Work of Regular Teachers (2015-2020)

Year of Publication and/or Conferences	Total Regular Professors	Publications		Presentations		
		In Arbitrated Journals	Others	talks	Conferences	Countries in which the conferences were offered
2015	2	0	1	0	0	n/a
2019	2	1	1	0	0	n/a
2020	2	1	1	0	0	n/a
2021	2	0	3	0	0	n/a

The CNEI program has a recruitment plan but there have been no permanent appointments in more than 10 years. During the first half of the evaluated decade, years 2010-2015, the need to recruit teaching staff with capacity and experience in supervising senior theses, in addition to interdisciplinary training in natural sciences, was emphasized. During this period, a teaching position for the program was approved and, although there was a call and interviews were coordinated, the funds were withdrawn and the offer had to be retracted. There has been no placement approval for the program since then. The last revision of the recruitment plan was carried out in 2021. On this occasion, in addition to the capacity and experience in training and supervising students in the development of their senior theses, the need for professors specialized in the teaching of database management and statistical analysis programs was expressed. This new description responds to the Program's interest in strengthening professional skills in CNEI alumni to meet current workforce needs as well as those projected for the future.

Current senior thesis teaching staff participate in course coordination and evaluation of assessment strategies, and technology integration in the teaching-learning process. All program professors are also invited to participate in professional improvement conferences and workshops sponsored by the campus Center for Academic Excellence (CEA in Spanish) and others.

III. Student services and academic support

CNEI degree students receive various types of services and support, including individualized academic counseling for active students in the program and guidance for those who are interested in changing to it. Students also access information about the program, curriculum, research opportunities and internship, among others, through its website: https://natsci.uprrp.edu/picn/ . One of the main limitations to offering individualized service

to students is the need for staff. Academic counseling is offered by the interim director and, until December 2021, an orientation officer from the deanship at the CNS. There is only one secretary to serve all students and other stakeholders, in addition to their regular administrative functions. Table 24 provides an estimate of the number of students who have received individual academic advising in the past 10 years. The data does not include advising instances through unscheduled visits to the office, by phone or email.

Table 24

Students assisted in academic counseling (estimated, does not include guidance by telephone or email)

Academic year	Number of students served/year
2012-2013	323
2013-2014	369
2014-2015	346
2015-2016	448
2016-2017	271
2017-2018	197
2018-2019	222
2019-2020	246

Another means of providing information to the students is through orientation fairs for graduate and professional schools organized by the CNEI office. These fairs have been offered once a semester for more than 20 years, except for the period in which there were restrictions due to the COVID-19 pandemic. The fairs were reestablished in the first semester of 2021-2022. During these fairs, the students have the opportunity to receive orientation from representatives of graduate and professional schools of their interest, in addition to learning about new schools and exploring opportunities showcased by the different invited resources. Among the schools that have participated in practically all the fair sessions offered over the past 10 years are those belonging to the Medical Sciences Campus, the Ponce Medical School, the Central University of the Caribbean, the Autonomous University of Guadalajara, the University of Medicine and Health Sciences in St. Kitts, NOVA School of Pharmacy, the Río Piedras Campus School of Law, and the Interamerican University Law School and School of Optometry.

The students' perception regarding the efficiency, effectiveness and satisfaction with program services and their experiences throughout their time as CNEI students has been evaluated using surveys, as well as by received comments and messages. In general terms, students express satisfaction with the services and with the program in general. During the

month of August in the years 2014-2019, students who had graduated in the previous academic year were sent a survey aimed at evaluating their satisfaction with the program in general, aspects of the curriculum and services received. On average, all respondent students who graduated between the years 2015-2019 considered that the CNEI program contributed to their professional development. Similarly, 96% of these students indicated that they would recommend the degree to others (Appendix 4). Expressions such as those presented below show a sense of appreciation for the training received through the program:

> "The program encourages the creation of inter and transdisciplinary knowledge in students, so that students graduate and demonstrate a broad vision of science, research and how they are a fundamental part of many disciplines."

> “Today, to continue graduate studies in Science, it is recommended to have an interdisciplinary education, and the program offered me the opportunity to adjust my baccalaureate to what was going to be my long-term professional goal. Not only did they help me in my professional goal, but also guided me. If I had the opportunity to go back in time and choose a degree, I would choose it again.”

In addition, most students highlighted the flexibility of the degree and the capstone experience as strengths of the program. Some comments from the students denote their assessment of the experiences in the program in their professional and personal training. Regarding professional training, some students indicated:

> “I was enriched in experience and learning, especially with the Capstone Course. I had the opportunity to learn how to conduct research and gain knowledge. I am sure it will be very useful in my professional development. Thank you!"

> “The experience of doing the capstone course helped me grow a lot professionally. I am taking great advantage of everything I learned during the capstone year now that I have decided to continue my graduate studies.”

> “... Capstone, oh Capstone! Despite the fact that you whimper when you are doing it, you learn a lot during the process and the fact of having made a poster is something that helps a lot for admissions to graduate school…”

Similarly, there were personal growth opportunities:

> "The interdisciplinary approach helped me to the extent that now I look at things from different perspectives or facets."

> "...This program helped me develop communication skills, create critical and organized thinking and, above all, be responsible…"
> "It allowed me to develop leadership, communication and research skills."
>
> "It helped me develop personal characteristics: values, perseverance, humility, commitment, optimism and organization to be a better professional. In addition, it helped me to be flexible, to have initiative, to develop myself as a leader and in the ability to work in a team."
>
> "It contributed to my personal development more than professional."

However, a weakness pointed out with great frequency was the difficulty in obtaining space in courses from other departments at the College (Appendix 6). This difficulty has been addressed over the years, mostly through dialogue with the different units. The situation has improved a lot, although the personnel and resource limitations faced by the other units often make it difficult for CNEI students to access some courses. In addition, some difficulties of the students during their senior thesis experience are noted, particularly in the first years of the surveys. In most cases, student claims have been addressed to further achievement of the capstone experience objectives. During the years 2016-2019, students in the CNEI 4012 (Capstone 2) course sections completed an evaluation survey during their last day, after having presented their projects in a poster session in the College lobby. As part of the survey response analysis, the items were grouped according to the following categories: Professional Training, Personal Training, General Satisfaction and Relevance (Appendix 4). Most of the students agreed that the course had contributed to their professional training and they recognized "having learned". Also, many expressed general satisfaction with the course and the impact on their personal training (Appendix 5).

IV. Information technology and skills

Students in the CNEI program complete most of their curriculum by taking courses from other departments in the College of Natural Sciences, which can include different technological resources. In addition, the capstone course curriculum includes training workshops on the use of electronic resources to obtain bibliographic information and other information skills. Students are also trained in the use of word processing and presentation preparation programs such as Word and PowerPoint, respectively. They also receive training in the use of programs for their project result statistical analysis. Finally, in the last two years there has been a transformation of administrative management and services towards modalities that use technological resources to optimize regular processes and innovate in the offering of services, especially for academic advising. This has required more training for teaching and non-teaching staff.

V. Facilities, laboratories and auxiliary equipment for teaching

The CNEI program does not have facilities, laboratories or other auxiliary resources since students complete most of the curriculum by taking courses from other departments in the College of Natural Sciences.

VI. Distinctive achievements of the program in the past 10 years

Over the past decade, development plans have been required in various instances. The 2018-2023 development plan of the CNEI program was prepared in an integrated manner with the undergraduate development plan of the Environmental Sciences department. It was done this way because the interim director served as director of both academic programs from July 2018 to May 2021 in an effort to consolidate administrative tasks. The last individual plan of the CNEI program was the one created for the 2013-2018 period (Appendix 7). Efforts to comply with this plan were pursued, but internal campus obstacles and others due to external causes such as student strikes and the passage of hurricanes Irma and María were confronted. However, some of the proposed projects have been initiated or completed. For example, in the Curriculum area, the link with research centers in the Medical Sciences Campus, Molecular Sciences, the Institute of Neurobiology, the Veterans Hospital and the San Jorge Hospital, in addition to the collaboration with researchers at the Río Piedras Campus have been maintained, but collaborations with foreign universities has not been achieved. Another curricular accomplishment has been execution of the student learning assessment plans. The "Students" section in the 2013-2018 Development Plan proposed an alumni survey. This was accomplished and also adopted as a yearly activity since August 2015. Continuity of the Graduate and Professional Studies Orientation Fair as a student service has also been maintained, except for the period during the COVID pandemic, as mentioned previously. Finally, the goals for "Recruitment" in the 2013-2018 Development Plan have not been achieved. A recruitment plan was developed and proposals were submitted during two calls for teaching appointments at the Campus, but none were awarded to the CNEI program.

VII. Analysis of strengths and areas to improve based on the lines included in this report, include the corrective actions that are proposed

The data collected for the different components of this report show many strengths for the CNEI program. Of these, its high retention and graduation rates stand out, as well as the rigor in the training offered throughout the senior thesis (capstone) courses, the emphasis on strengthening quantitative and mixed analysis skills without undermining students' socio-humanistic growth, and student services.

Nonetheless, the CNEI program is not lacking in areas for improvement. In the academic area, a curricular revision is recommended to propose minor changes to the program. A change to be proposed is the modification for the credits assigned to the CNEI 4011 and CNEI 4012 courses. Currently, CNEI 4011 consists of one credit with a workshop period, that is, the sections meet in one hour and 20 minute periods. The course professors have

commented that this is not enough time to reinforce learning through training experiences and practice activities in the classroom. Similarly, the CNEI 4012 course must also be reviewed since it consists of two credits and meets for one hour and 50 minutes. This turns out to be a long time because students are mainly working independently on their projects, therefore classroom meetings are less frequent. If the credits are inverted so that CNEI 4011 is two credits and CNEI 4012 is one credit, more time can be devoted for student training and practice experiences.

Another consideration during the degree revision would be to evaluate the possibility of accrediting some courses on natural science topics offered in other Colleges on campus to enrich the specialized elective options and strengthen the interdisciplinary link with other disciplines. For example, the College of Social Sciences offers Human Evolution (ANTR 3046) and Human Osteology (ANTR 4086) in the Anthropology department. Also, the Geography department has courses in Marine Geography (GEOG 3800) and Karstic Geography (GEOG 4375). Human Development (PSIC 3025) is offered in the Psychology Department. These are some examples of courses that can allow CNEI students to relate concepts associated with the natural sciences from a social sciences perspective. Other options to be considered include the creation of science communication courses in collaboration with the School of Public Communication and the inclusion of natural science education courses. Also, strengthening quantitative and mixed analysis skills, and data management and analysis, among others, through technology use in academic experiences is important for optimizing students' experience as young researchers. Courses such as Introduction to Computer Science (CCOM 3030) and Fundamentals of Information Systems (SICI 3211), among others, would be suitable for this objective.

In addition to modifications to the curriculum, another recommendation would be to include the capstone senior thesis titles in the course credit transcripts, in a manner similar to the graduate theses title annotations. The students do a commendable job in their research projects, some have even had the opportunity to present their projects in different professional forums while others have published their work in peer-reviewed journals.

The CNEI program's urgent need for teaching and non-teaching staff is also an essential consideration during the present evaluation. The teaching staff is necessary to offer senior thesis courses and also to collaborate in the creation of additional training courses to strengthen students' critical thinking and research skills applying interdisciplinary approaches to natural sciences issues. Regarding the non-teaching staff, help is needed for student academic advising, orientation for students interested in changing to the Program, reclassification and graduation evaluations, and support in other administrative tasks.

The relevance and importance of having a natural sciences undergraduate degree with an interdisciplinary approach in the College of Natural Sciences at the UPR Río Piedras campus

must be underscored. Given the current reality in which scientists recognize that the unprecedented and urgent challenges facing modern society need an interdisciplinary approach combining natural sciences with social sciences, humanities and other disciplines, development of the Natural Sciences Interdisciplinary Studies Program should envision its key role in science education and training of future scientists and professionals.

Appendices

Appendix 1 Curriculum of the CNEI degree

Información General y Currículo del Bachillerato en Ciencias Naturales – Estudios Interdisciplinarios (CNEI)

El currículo del bachillerato CNEI consiste de 121 créditos de los cuales 60 corresponden a cursos en la Facultad de Ciencias Naturales. El bachillerato es administrado en el Programa Interdisciplinario en Ciencias Naturales (PICN).

¿Por qué hacer un grado en estudios interdisciplinarios en ciencias naturales?

La visión pedagógica del PICN está fundamentada en el desarrollo de las destrezas de investigación, análisis y pensamiento critico a través de la aplicación del método científico. Mediante asesorías académicas se desarrolla, junto al estudiante, un programa de estudios personalizado a sus metas profesionales. El objetivo es que aprecie la interdisciplinariedad de las ciencias naturales junto a otras disciplinas del conocimiento humano.

Oportunidades para estudiantes

Los egresados CNEI están capacitados para proseguir estudios graduados, ingresar a escuelas profesionales o entrar al mundo laboral. También le permite trabajar en industrias farmacéuticas y agencias del gobierno. No obstante, las posibilidades laborales de nuestros egresados puede incluir alternativas de trabajo adicionales, de acuerdo al enfoque elegido por el estudiante para desarrollar su bachillerato interdisciplinario en ciencias naturales.

CURRÍCULO

I. Educación General (42-43 créditos)

Español, 6 créditos
Inglés, 6 créditos
Literatura, 6 créditos[1]
CISO 3121-3122, 6 créditos
Humanidades, 6 créditos[1]
Arte, 3 créditos[1]
Educación General-Ciencias Naturales, 6 créditos[2]
Pensamiento Lógico-Matemático, 3-4 créditos[3]

II. Requisitos de Facultad (33 créditos)

Curso	Crs.	Pre-requisito
BIOL 3102	4	Ninguno
BIOL 3101	4	QUIM 3001
QUIM 3001-3002	8	MATE 3172 ó 3018
FISI 3011-12 FISI 3013-14	8	MATE 3151
MATE 3026	3	MATE 3172 ó 3018
BIOL 3349	3	BIOL 3101 y MATE 3026
CINA 3005	3	Ninguno

III. Electivas Dirigidas (24 créditos) [4, 5]

Cursos de nivel superior a los requisitos de la Facultad. Incluye TODOS los cursos CNEI, BIOL, QUIM, FISI y CCOM; cursos de Matemáticas que sean posteriores a Cálculo 1 y la mayoría de los cursos de Ciencias Ambientales (ej. CINA 3128 NO cuenta como electiva dirigida).

IV. *Capstone* (3 créditos)

CNEI 4011[6] - 4012[7]

V. Electivas Libres (18 créditos) [5]

Total de créditos para el bachillerato: 121

[1] Es responsabilidad del estudiante corroborar que los cursos elegidos para estos componentes estén en el listado de cursos válidos establecido por el Decanato de Asuntos Académicos. El listado está disponible en: https://academicos.uprrp.edu/normativa-academica/programas/revision-de-bachillerato/

[2] Elegir dos cursos (CIBI 4105, CIBI 4006, CIFI 4005 y/o CIFI 4995).

[3] Se recomienda Cálculo I (MATE 3151) ya que es pre-requisito del curso de Física Universitaria. De escoger otro curso, el total de créditos del bachillerato aumentará a 125.

[4] Cursos con máximo de créditos permitidos:

Tutorías—3 crs. (sólo dos (2) de un mismo curso)

Investigación- 4 crs.

[5] No incluye cursos del Departamento de Matemáticas requeridos como clases de destrezas básicas .

[6] Para matricular *Capstone* 1 debe tener **aprobados los requisitos de Facultad y al menos 15 créditos en electivas dirigidas.** Es recomendable que el estudiante haya aprobado un curso de redacción y tener experiencia de investigación subgraduada *antes* de tomar el primer curso *Capstone*.

[7] Las tesinas *Capstone* no están sujetos a la revisión del CIPSHI ni del DEGI ya que técnicamente no serían investigaciones cuyos resultados serían publicados sino que constituyen ejercicios de clase para aprendizaje. No obstante, dada la importancia de la revision ética a proyectos que usarán seres humanos como sujeto de investigación, se requerirá evidencia de los certificados de CITI Program correspondientes, además de la aprobación por el Comité de Ética o *Institutional Review Board* (IRB) de las facilidades de investigación del mentor/a.

Requisitos de graduación

1. Promedio General y en Ciencias mínimo de 2.00.
2. Los 24 créditos de Electivas dirigidas y *Capstone* deberán ser aprobados con C o más.

Ejemplo de Secuencia Curricular para estudiantes **QUE TIENEN** la preparación matemática para tomar dos ciencias y cálculo en su primer semestre en el bachillerato CNEI.

PRIMER AÑO

CISO 3121	3	CISO 3122	3
BIOL 3102	4	BIOL 3101*	4
QUIM 3001*	4	QUIM 3002	4
MATE 3151 *	4	CINA 3005	3
	15		14

SEGUNDO AÑO

INGLÉS	3	INGLÉS	3
ESPAÑOL	3	ESPAÑOL	3
FÍSICA I*	3	FÍSICA II	3
FÍSICA LAB	1	FÍSICA LAB	1
ELEC CN	4	ELEC CN	4
ELEC LIBRE	3	ELEC LIBRE	3
	17		17

TERCER AÑO

LITERATURA	3	LITERATURA	3
ELEC CN	3	MATE 3026*	3
ED GEN CN	3	ED GEN CN	3
ELEC LIBRE	3	ELEC LIBRE	3
ARTE	3	INVESTIG	1
INVESTIG	1		13
	16		

CUARTO AÑO

HUMA	3	HUMA	3
ELEC CN	3	ELEC CN	3
BIOL 3349	3	ELEC LIBRE	3
ELEC LIBRE	3	CAPSTONE II*	2
CAPSTONE I*	1	INVESTIG	1
INVESTIG	1		12
	14		

La Experiencia *Capstone*

La experiencia *capstone* consiste de una actividad de expresión creativa que permite al estudiante desarrollar e integrar el conocimiento adquirido a través de su educación interdisciplinaria subgraduada.

Esta experiencia promueve el aprendizaje basado en inquirir además de fortalecer destrezas como la resolución de problemas, el pensamiento crítico y analítico, búsqueda de literatura y uso de recursos informáticos, y la comunicación escrita y oral, entre otros. Estas destrezas son requeridas en los escenarios profesionales y promueven un enlace hacia la educación graduada.

***Capstone* I (CNEI 4011)**– 1 crédito

El curso consiste de talleres, conferencias y mentorías individualizadas para guiar a los estudiantes en la elaboración de una propuesta de investigación o proyecto que integre las disciplinas de su interés enfatizadas en sus estudios subgraduados.

Durante este periodo los estudiantes desarrollan su propuesta bajo la supervisión de su mentor(a) y profesor(a) del curso. La propuesta se presenta de forma escrita y oral al final del semestre.

***Capstone* II (CNEI 4012)**– 2 créditos

Luego de la aprobación de la propuesta, los estudiantes realizan sus proyectos y presentan los resultados al final del semestre. Elaboran un trabajo escrito en formato de publicación científica; además presentan sus proyectos a través de la exposición de afiches en el vestíbulo de la Facultad de Ciencias Naturales.

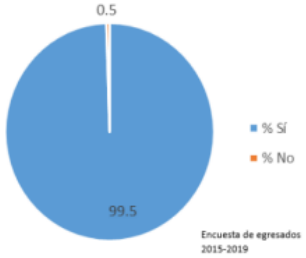
Perfil del egresado

Al finalizar el grado de Bachiller en ***Ciencias Naturales– Estudios Interdisciplinarios (CNEI)***, el egresado:

1. Integra su conocimiento en las Ciencias y Matemáticas para la resolución de problemas en su quehacer diario y en nuestra sociedad.
2. Demuestra conocimiento en el uso y aplicación de las tecnologías en la búsqueda de información, su análisis e incorporación a su propia base de conocimiento.
3. Establece conexiones entre el conocimiento científico y otras disciplinas como las humanidades, las artes y las ciencias sociales entre otras, pertinentes a su meta de estudio o trabajo.
4. Demuestra comunicación efectiva en español e inglés tanto oral como escrita.
5. Está capacitado para proseguir estudios graduados en el campo especializado de su interés o en escuelas profesionales.
6. Toma decisiones basadas en el análisis sistemático, crítico y ético tanto en su profesión como en su vida diaria.

Estudio de egresados

¿Consideras que el Bachillerato en Ciencias Naturales - Estudios Interdisciplinarios (CNEI) contribuyó en tu desarrollo profesional?



Requisitos de admisión por Reclasificación, Traslado y Transferencias

Promedio general: 3.00

Promedio Ciencias y Matemáticas: 3.00

Entrevista con el(la) director(a)

Tener aprobado:

- Cálculo 1 (MATE 3151 o su equivalente)
- Ciencias básicas (aprobar dos (2) de seis (6): Biología General, Química General y/o Física Universitaria): 8 créditos

Dirección Física:

Universidad de Puerto Rico
Recinto de Río Piedras
Facultad de Ciencias Naturales
Fase I, CN-135

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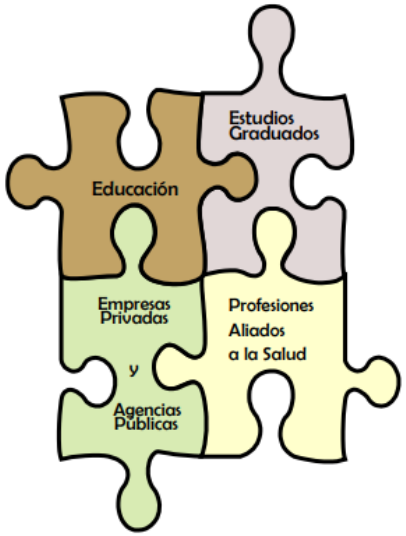
Revisado: abril 2022

Universidad de Puerto Rico
Recinto de Río Piedras
Facultad de Ciencias Naturales

Bachillerato en Ciencias Naturales - Estudios Interdisciplinarios (CNEI)



http://natsci.uprrp.edu/picn/

Appendix 2

Summary of the domains, learning objectives, achievement indicators and results for student learning assessment in the CNEI program during the years 2010-2020.

UPRRP Domain	Learning objective	Achievement indicators (dm-direct measure; im- indirect measure)	Results
Research and Creation	The student will strengthen their scientific method application skills through their science courses and an interdisciplinary senior thesis.	**1st evaluation instance** BIOL 3102 ● exam questions (dm) ● lab reports (dm) CINA 3005 ● Application exercise-application of the scientific method (5 multiple choice questions; dm) indicator: 70% of students respond correctly to at least 4 questions.	**1st evaluation instance** In the instances in which there has been data, the proposed objectives have been achieved. It is necessary to identify recurring instances or activities to obtain more accurate results. In the application exercise, the objective was not achieved since the average score was 3 (60%). Further instances using practice problems to apply scientific method concepts is recommended to strengthen student comprehension beginning in their first undergraduate year of degree. Activities to improve students' understanding of concepts related to independent and dependent variables, research design. It was found that the latter were concepts with

UPRRP Domain	Learning objective	Achievement indicators (dm-direct measure; im- indirect measure)	Results
			difficulty of understanding.
		2nd evaluation instance FISI 3013 and 3014 ● lab reports (dm) indicator: 70% of students score 70% or higher on research criteria CNEI 4011 ● Proposed dissertation score (dm) indicator: 70% of the students will obtain a grade of at least 85% in the final proposal.	**2nd evaluation instance** The objectives established for the University Physics laboratories (FISI 3013 and 3014) were achieved. The proposals prepared in the CNEI 4011 course met the established objectives. This compliance is to be expected since students first submit a draft proposal that is corrected and discussed with the professor. This opportunity enriches the learning process and allows students to correct their initial mistakes.
		3rd evaluation instance CNEI 4012 ● Thesis score (dm) indicator: 70% of the students will obtain a grade of at least 90% in the final senior thesis.	**3rd evaluation instance** As in the CNEI 4011 course, the theses prepared as part of the CNEI 4012 course are first handed in as a draft that is discussed with the professor. This favors compliance with the achievement indicators. Discussion of the proposal and dissertation drafts

UPRRP Domain	Learning objective	Achievement indicators (dm-direct measure; im- indirect measure)	Results
			represents a real opportunity for students' learning and professional growth as they receive recommendations from professors and mentors in order to learn from their mistakes.
Critical thinking	Students will apply their thinking skills to evaluate situations and reach conclusions or make a judgment using their own criteria.	**1st evaluation instance** BIOL 3102 ● exam questions (dm) ● lab reports (dm) CINA 3005 ● reflective essay (dm) indicator-70% of students will get at least 8/10 on the essay.	**1st evaluation instance** The results have been variable. It is necessary to identify recurring instances or activities and obtain representative samples of the group. In the reflective essay the objective was achieved, however the need to expand the use of scientific vocabulary and the diversity of the general vocabulary was observed.
		2nd evaluation instance FISI 3013 and 3014 ● lab reports (dm) indicator: 70% of students score 70% or higher on research criteria CNEI 4011 ● Proposed dissertation score (dm) indicator: 70% of the students will obtain a grade of "good" or "excellent" in the Introduction criterion.	**2nd evaluation instance** The objectives established for the Physics laboratories (FISI 3013 and 3014) were achieved, therefore, the goal was achieved.

UPRRP Domain	Learning objective	Achievement indicators (dm-direct measure; im- indirect measure)	Results
		3rd evaluation instance CNEI 4012 ● Dissertation score (dm) indicator: 70% of the students will obtain a grade of “good” or “excellent” in the Discussion criterion.	**3rd evaluation instance** The goal was achieved.
Logical and mathematical reasoning	The student will develop quantitative data analysis skills to propose plausible arguments to provide possible explanations and applications of experimental results.	**1st evaluation instance** CINA 3005 ● Open question on scientific method (dm)- evaluation of Type of data to collect, Proposed data analysis and Logical reasoning indicator: 70% of students get a score of at least 70%. ● Interpretation of graphs module (dm)- indicator- 70% of students obtain at least 70% of correct answers (20/25) in the evaluation of the module.	**1st evaluation instance** For the open question, although the proposed objective was achieved, there were notes related to the lack of maturity in the expression and vocabulary of the students. Regarding the graph interpretation module, it was used in 3 consecutive semesters in which the objective was not achieved at the beginning, but when carrying out transformative actions in teaching and student practices, an improvement was observed until the objective was achieved in the third semester.

UPRRP Domain	Learning objective	Achievement indicators (dm-direct measure; im- indirect measure)	Results
		2nd evaluation instance CNEI 4011 ● Statistics Review Workshop (dm) indicator- 70% of the students will pass the evaluation of the workshop with at least 70% ● Methodology criterion in the proposal (dm)- indicator- 70% of the students will obtain a rating of "good" or "excellent" in the criterion	**2nd evaluation instance** Objectives were achieved.
		3rd evaluation instance CNEI 4012 Results Criteria, and Tables and Graphs in the dissertation. indicator- 70% of the students will obtain a grade of “good” or “excellent” in the criterion.	**3rd evaluation instance** The goal was achieved.
Discipline content	The student will apply the knowledge, skills and attitudes of different disciplines related to natural sciences in problem solving.	**1st evaluation instance** CINA 3005 (E) Indicator- 70% of students will score 70% or higher in the course.	**1st evaluation instance** The goal was achieved.
		2nd evaluation instance CNEI 4011 Criteria of Introduction and Methodology of the proposal (dm) indicator- 70% of the students will obtain a rating of "good" or "excellent" in the criteria	**2nd evaluation instance** The goal was achieved.
		3rd evaluation instance CNEI 4012 Discussion Criteria (dm) indicator- 70% of the students will obtain a grade of “good” or “excellent” in the criterion.	**3rd evaluation instance** The goal was achieved.
Effective communication	The student will express himself clearly, coherently and precisely.	**1st evaluation instance** BIOL 3102- laboratory reports (dm) ● Compliance Information Management Module from Indiana University (https://www.indiana.edu/~istd/) CINA 3005- reflective essay (dm) indicator-70% of students will get at least 8/10 on the essay.	**1st evaluation instance** The results have been variable. It is necessary to identify recurring instances or activities and obtain representative samples of the group.

UPRRP Domain	Learning objective	Achievement indicators (dm-direct measure; im- indirect measure)	Results
		2nd evaluation instance FISI 3013 and 3014 laboratory reports (dm) indicator: 70% of students obtain 70% or more in research criteria CNEI 4011 ● Presentation Criteria (dm)- indicator-70% of the students will obtain a grade of "good" or "excellent" in the criterion. ● Indiana University (im) Compliance Information Management Module (https://www.indiana.edu/~istd/) ● Exercise on plagiarism avoidance (5 pts, dm) indicator- 70% or more of the students will obtain at least 4 out of 5 points.	**2nd evaluation instance** The objectives established for the Physics laboratories (FISI 3013 and 3014) were achieved. The goal was achieved. On average, approximately 98% of the students provide evidence of completion of the module, so the objective that all students complete the module is not achieved. On average, more than 70% of students pass at least 4 questions in the exercise.
		3rd evaluation instance Presentation Criteria (dm) indicator- 70% of students will score "good" or "excellent" on the criterion.	**3rd evaluation instance** The goal was achieved.
Information skills	The student will demonstrate skill development in technology use, and identification and appropriate handling of information relevant to a problem or matter of a scientific nature.	**1st evaluation instance** BIOL 3102- Compliance Information Management Module from Indiana University (MI) (https://www.indiana.edu/~istd/)	**1st evaluation instance** Not all students completed the module. For the academic year 2021-2022, the evaluation of library modules in the College of Natural Sciences was proposed for the assessment of this domain.

UPRRP Domain	Learning objective	Achievement indicators (dm-direct measure; im- indirect measure)	Results
		2nd evaluation instance CNEI 4011 ● Completion of information management module of the University of Indiana (MI) (https://www.indiana.edu/~istd/) indicator- All students will deliver the module certification. ● Workshop: Preparation of Annotated Bibliographies (dm) indicator- 70% of the students will obtain 70% or more in the annotated bibliography task ● Workshop: How to avoid plagiarism (dm) indicator- 70% of the students will obtain at least 4 out of 5 points in the evaluation. ● CITI Module: *Responsible Conduct in Research (RCR* , mi *)* indicator- All students will deliver the module certification. ● Introduction Criteria and Bibliographic Records (dm) indicator- 70% of the students will obtain a grade of “good” or “excellent” in the criteria.	**2nd evaluation instance** Even though handing in the certificates from University of Indiana and the CITI Program (*Responsible Conduct in Research*) modules are included in the course score, not all students comply. About 1-2 students do not comply each semester, which represents approximately 6% of the group. If compliance stringency is maintained at 100%, then we can conclude that the objective is not met. The objectives for the *Annotated Bibliography Preparation* and *How to Avoid Plagiarism* workshops were achieved, as well as for the Introduction and Bibliographic Records criteria in the proposal.
		3rd evaluation instance Criterion for Results, Discussion and Bibliography (dm) indicator- 70% of the students will obtain a grade of "good" or "excellent" in the criteria.	**3rd evaluation instance** Objectives were achieved.

UPRRP Domain	Learning objective	Achievement indicators (dm-direct measure; im- indirect measure)	Results
Social responsibility	The student will demonstrate social responsibility in their behavior and interaction with the community and the environment.	**3rd evaluation instance** In 2008, a questionnaire developed in the College of General Studies was used. Measures included environmental protection, heritage protection, violence against women and academic honesty.	There were difficulties in interpreting the results. It was ultimately determined not to use the data. For the year 2013, social responsibility items were created for the three evaluation instances. The document focused on perceptions towards the environment and conservation. Three Likert scale questionnaires were created. The questionnaires have not been administered. indicator- 70% of those surveyed would obtain a score equivalent to 70% on the scale.
Capacity for Independent Study	Apply scientific methodology creatively to the understanding of scientific theories, pure research, and applied science.	**2nd evaluation instance** CNEI 4011 ● Senior Thesis Proposal score (dm) indicator: 70% of the students will obtain a grade of at least 85% in the final proposal.	**2nd evaluation instance** The goal was achieved.
		3rd evaluation instance CNEI 4012 ● Senior Thesis score (dm) indicator: 70% of the students will obtain a grade of at least 90% in the final thesis.	**3rd evaluation instance** The goal was achieved.
Learning throughout life	The student is qualified to pursue graduate studies in the	**3rd evaluation instance** Alumni surveys https://natsci.uprrp.edu/picn/graduate-surveys/	Students express great satisfaction with the CNEI program

UPRRP Domain	Learning objective	Achievement indicators (dm-direct measure; im- indirect measure)	Results
	scientific field of interest or in professional schools.		curriculum. The majority of those surveyed reported having continued studies after graduation.

Appendix 4

Publications for regular and full-time contract teaching staff (2015-2020).

Teacher's name	Type of appointment (R-regular; C- full time contract; P- partial task contract)	Bibliographic file	Type of publication (A-peer reviewed; N- peer reviewed)
Gabriel Moreno Viqueira	R	1. Moreno, G. 2015. Towards a sustainable city. El Nuevo Día. 2. Moreno, G. 2019. Interdisciplinary education in the natural sciences for the challenges of our society: The case of the environment. Proceedings of the XIX International Conference on Educational Research: Committed Research for Social Transformation: Innovative Experiences and Socio-educational Development. V, 384-389. 3. Moreno, G. & Furumo, P. 2019. Energy, the climate crisis, and urbanism in Puerto Rico. Journal of Public Administration, UPRRP. 4. Moreno, G..2021. Ecocitizenship: the true meaning of being a citizen El Nuevo Día. 5. Moreno, G. 2021. The most urgent science at the UPR is in danger of extinction. El Nuevo Día. 6. Moreno, G. 2021. Rachel Carson: The Woman Who Changed Planet Earth. El Nuevo Día.	N A N N N N
Elizabeth Dvorsky Soa	R	1. Hernández-Torrales M, Dvorsky-Sosa E, MacLeary T, Molina-Rivera I. 2020. Policy for Disposal of Frozen Embryos. *In*: Essays in Bioethics: A Puerto Rican Perspective. 1 ed. Oliver-Vázquez M, (Ed). Eugenio María de Hostos Institute of Bioethics; 271-306. 414p.	N
Edwin Hernandez Delgado	C* (*since 2015)	1. Hernández-Delgado, EA 2015. The emerging threats of climate change impacts on tropical coastal ecosystems, public health, local economies and livelihood sustainability. *Mar. Poll. Bull.* 101:5-28. 2. Ramos-Scharrón, C., D. Torres-Pulliza, & EA Hernández-Delgado. 2015. Watershed- and island-scale land cover changes in Puerto Rico (1930s-2004) and their potential effects on coral reef ecosystems. *Science of the Total Environment* 506-507:241-251. 3. Sturm, P., R. Viqueira-Ríos, J. Medina, G. Padilla, EA Hernández-Delgado, C. González-Ramos, A. Montañez-Acuña, A. Otaño-Cruz, BJ Rosado-Matías, & G. Cabrera-Beauchamp. 2015. Cabo Rojo Community Watershed Action Plan for Water Quality and Coral Reefs. Technical Report submitted to NOAA, Silver Spring, MD. 58 pages + App. 4. Ramos-Scharrón, CE, C. Rogers, EA Hernández-Delgado, J. Restrepo, F. Botero, S. Coldren, JR Garza-Pérez, P. Sánchez-Navarro, Q. Dokken, R. Ferguson, J. Koss, R. Martindale, L. Vandiver, & RA Viqueira-Rios. 2016. Caribbean coral reefs at risk: Improved decision making through better science and communication. *Reef Encounter* 31:61-66. 5. Hernández Delgado, EA **.,** JL Medina-Muñiz, H. Mattei, & J. Norat-Ramírez. 2017. Unsustainable land use, sediment-laden runoff, and chronic raw sewage offset the benefits of coral reef ecosystems in a no-take marine protected area. *send Mgmt. Subst. Dev* . 6(2):292-333. 6. Hernández Delgado EA **,** & BJ Rosado-Matías. 2017. Long-lasting impacts of beach renourishment on nearshore urban coral reefs: A glimpse on future impacts of shoreline erosion, sea level rise and climate change. *Annals Mar. Biol. Res.* 4(1):1021. 7. Lugo, AE, M. Barreto Orta, M. Canals Silander, R. Chaparro, M. Santos Corrada, **E. Díaz** , JG González Lagoa **,** EA Hernández Delgado, and José Molinelli. 2017. Palmas del Mar Manifesto: What to do if the sea does not stay still and the coasts continue to change? *Scientific Act* 31(1-3):79-117, 20197. 8. Otaño-Cruz, A., AA Montañez-Acuña, VI Torres-López, EM Hernández-Figueroa, & **EA** Hernández-Delgado. 2017. Effects of changing weather, oceanographic conditions, and land uses on spatio-temporal variation of sedimentation dynamics along near-shore coral reefs. *Front. Mar. Sci* . 4:249. 9. Alpert, AE, AL Cohen, DW Oppo, TM DeCarlo, GA Gaetani, EA Hernández-Delgado, A. Winter, & ME Gonneea (2017), Twentieth century warming of the tropical Atlantic captured by Sr-U paleothermometry. *Paleoceanography* , 32, doi:10.1002/2016PA002976.	A* (*applies to all)

Teacher's name	Type of appointment (R-regular; C- full time contract; P- partial task contract)	Bibliographic file	Type of publication (A-peer reviewed; N- peer reviewed)
		10. Ramos-Scharrón, CE, C. Rogers, EA Hernández-Delgado, J. Restrepo, F. Botero, S. Coldren, JR Garza-Pérez, P. Sánchez-Navarro, Q. Dokken, R. Ferguson, J. Koss, R. Martindale, L. Vandiver, & RA Viqueira-Rios. 2016. Caribbean coral reefs at risk: Improved decision making through better science and communication. *Reef Encounter* 31:61-66. 11. Hernández Delgado, EA **.,** JL Medina-Muñiz, H. Mattei, & J. Norat-Ramírez. 2017. Unsustainable land use, sediment-laden runoff, and chronic raw sewage offset the benefits of coral reef ecosystems in a no-take marine protected area. *send Mgmt. Subst. Dev* . 6(2):292-333. 12. Hernández Delgado EA **,** & BJ Rosado-Matías. 2017. Long-lasting impacts of beach renourishment on nearshore urban coral reefs: A glimpse on future impacts of shoreline erosion, sea level rise and climate change. *Annals Mar. Biol. Res.* 4(1):1021. 13. Lugo, AE, M. Barreto Orta, M. Canals Silander, R. Chaparro, M. Santos Corrada, **E. Díaz** , JG González Lagoa **,** EA Hernández Delgado, and José Molinelli. 2017. Palmas del Mar Manifesto: What to do if the sea does not stay still and the coasts continue to change? *Scientific Act* 31(1-3):79-117, 20197. 14. Otaño-Cruz, A., AA Montañez-Acuña, VI Torres-López, EM Hernández-Figueroa, & **EA** Hernández-Delgado. 2017. Effects of changing weather, oceanographic conditions, and land uses on spatio-temporal variation of sedimentation dynamics along near-shore coral reefs. *Front. Mar. Sci* . 4:249. 15. Alpert, AE, AL Cohen, DW Oppo, TM DeCarlo, GA Gaetani, EA Hernández-Delgado, A. Winter, & ME Gonneea (2017), Twentieth century warming of the tropical Atlantic captured by Sr-U paleothermometry. *Paleoceanography* , 32, doi:10.1002/2016PA002976. 16. Toledo-Hernández, CG, CP Ruiz-Díaz, EA Hernández-Delgado, & SE Suleimán-Ramos. 2018. Devastation of 15-year old community based on coral farming and reef restoration sites in Puerto Rico by major Hurricanes Irma and María. *Caribbean. Naturalist* 53:1-6. 17. Hernández-Delgado, EA, S. Barba-Herrera, A. Torres-Valcárcel, CM González-Ramos, JL Medina-Muñiz, AA Montañez-Acuña, A. Otaño-Cruz, BJ Rosado-Matías, & G. Cabrera-Beauchamp . 2018. Coral reef resilience index – A spatial planning tool for managers and decision makers: A case study from Puerto Rico. 177-211. In, Duque-Beltrán, C., & E. Tello-Camacho (Eds.), *Corals in a Changing World* , InTech Publ. ISBN 978-953-51-3910-0. 18. Hernández-Delgado, EA **,** AE Mercado-Molina, & SE Suleimán-Ramos. 2018. Multi-disciplinary lessons learned from low-tech coral farming and reef rehabilitation practices. I. Best management practices. 213-243. In, Duque-Beltrán, C., & E. Tello-Camacho (Eds.), *Corals in a Changing World* , InTech Publ. ISBN 978-953-51-3910-0. 19. Hernández-Delgado, EA, Mercado-Molina AE, Suleimán-Ramos SE, & MA Lucking. 2018. Multi-disciplinary lessons learned from low-tech coral farming and reef rehabilitation practices. II. Coral demography and social-ecological benefits. 245-268. In, Duque-Beltrán, C., & E. Tello-Camacho (Eds.), *Corals in a Changing World* , InTech Publ. ISBN 978-953-51-3910-0. 20. Weil, E., EA Hernández-Delgado, M. González, S. Williams, S. Suleimán-Ramos, M. Figuerola, and T Metz-Estrella. 2019. Spread of the new coral disease "SCTLD" into the Caribbean: implications for Puerto Rico. *Reef Encounter* 34(1):38-43. 21. Otaño-Cruz, A., AA Montañez-Acuña, E. Benson, EP Cuevas, J. Ortiz, & EA Hernández-Delgado. 2019. Response of near-shore coral reefs benthic communities to changes of sedimentation dynamics and environmental conditions. *Front. Mar. Sci.* 6, doi: 10.3389/fmars.2019.00551 22. Norat-Ramírez, J., P. Méndez-Lázaro, EA Hernández-Delgado, H. Mattei-Torres, & L. Cordero-Rivera. 2019. A septic weight index model to measure the impact of septic tanks on coastal water quality and coral reef communities in Rincón, Puerto Rico. *Ocean Coast. Mgmt.* 169:201-213. 23. Rivera-Aponte, IM, EA Hernández-Delgado, J. Bauzá-Ortega, & W. Ithier-Guzmán. 2019. Spatial distribution and habitat preference of the lionfish *Pterois volitans* in the San Juan Bay Urban Estuary. *Perspectives on Environmental Issues* 7:74-90 24. Cortés-Useche, C., EA Hernández-Delgado, J. Calle-Triviño, & JE Arias-González. Condition assessment across the Bayahibe coral reefs: A case study of local management in the Dominican Republic. *Peer J* (Accepted) 25. Mercado-Molina, AE, AM Sabat, & EA Hernandez-Delgado. 2020. Population dynamics of diseased corals: Effects of a shut-down reaction outbreak in Puerto	

Teacher's name	Type of appointment (R-regular; C- full time contract; P- partial task contract)	Bibliographic file	Type of publication (A-peer reviewed; N- peer reviewed)
		Rican *Acropora cervicornis* . *Advances in Marine Biology* 87(1): https://doi.org/10.1016/bs.amb.2020.08.001 26. Precht, WF, RB Aronson, TA Gardner, JA Gill, JP Hawkins, EA Hernández-Delgado, WC Jaap, TR Mcclanahan, MD Mcfield, TJ Murdoch, MM Nugues, CM Roberts, CK Schelten, AR Watkinson, and IM Côté 2020. The timing and causality of ecological shifts on Caribbean coral reefs. *Advances in Marine Biology* , 87(1). https://doi.org/10.1016/bs.amb.2020.08.008 27. Gómez Andújar, NX, & EA Hernández-Delgado. 2020. Spatial benthic community analysis of shallow coral reefs to support coastal management in Culebra Island, Puerto Rico. *Peer J* 8:e10080 DOI 10.7717/peerj.10080 28. Zimmerman, JK, MX Willig, & EA Hernandez-Delgado . 2020. Resistance, resilience and vulnerability of socio-ecological systems to hurricanes in Puerto Rico. *Ecosphere* 11(10): https://doi.org/10.1002/ecs2.3159 29. Bayraktarov, E., M. Angel, JE Arias, EA Avila Pech, N. Charuvi, V. Galván, M. Gnecco, SD Guendulain Garcia, EA Hernández Delgado, JA Marin Moraga, S. Mercado, P. Montoya Maya, M Morikawa, G. Nava, V. Pizarro, R. Sellares, SE Suleimán Ramos, J. Calle Treviño, T. Villalobos Cubero, M. Villalpando, F. Virdis, C. Zepeda Centeno, & S. Frias-Torres. 2020. Review of coral reef restoration efforts in Latin American countries and territories. *Plos ONE* 15(8): https://doi.org/10.1371/journal.pone.0228477 30. Hernández-Delgado, EA, C. Toledo-Hernández, CP Díaz-Ruíz, N. Gómez-Andújar, JL Medina-Muñiz, SE Suleimán-Ramos, MF Canals-Silander. 2020. Hurricane impacts and the resilience of invasive sea vine, *Halophila stipulacea* : A case study from Puerto Rico. *Estuaries and Coasts* https://doi.org/10.1007/s12237-019-00673-4 , 1-21.	

Appendix 4

Evaluation of the CNEI 4012 course by students in the years 2016-2019.

Evaluation results by students of the capstone course at the end of CNEI 4012 in the years 2016-2019 are presented. There was a total of 138 respondents during the last day of the CNEI 4012 course. The values represent the average responses for 4 semesters. The instrument needs to be reviewed as there was no neutral option.

CATEGORY	PREMISE	Agree (%)	Partially Agree (%)	Partially Disagree (%)	Disagree (%)	Summary of findings
Vocational training	Premise 1. The capstone experience does not contribute to my training as a future professional.		8.4	8.7	77.2	- Approx. 77% consider that the capstone experience contributes to their training as a future professional
	Premise 15. My capstone project is closely related to my professional interest.		33.4	8.4	16.2	- 42% have some degree of agreement that their project is closely related to their professional interest
	Premise 24. Through my capstone project I realized that I don't like what I planned to study or practice as a professional career.		7.6	7.8	80.5	- Approx. 81% confirmed what they wanted to study or pursue as a career through their capstone project
Personal formation	Premise 18. The capstone experience helped improve my self-esteem		27	19.1	14.1	- Approx. 40% have some degree of agreement that the capstone experience helped improve their self-esteem
	Premise 20. I have more self-confidence due to my experience in the course.		34.6	7.2	6.8	- Approx. 52% have some degree of agreement that their self-confidence increased due to the course experience
	Premise 22. I feel more confident expressing myself in public.		40	12.3	3.1	- Approx. 45% have some degree of agreement that they feel more confident expressing themselves in public
overall satisfaction	Premise 2. I would take a course with this format again.		30.5	12.9	8.6	- 48% "have some degree of agreement that they would take a capstone course again

CATEGORY	PREMISE	Agree (%)	Partially Agree (%)	Partially Disagree (%)	Disagree (%)	Summary of findings
	Premise 4. The activities and workshops did not help me understand the concepts studied.		10.2	31.2	52.1	- Approx. 52% consider that the activities and workshops helped in understanding concepts.
	Premise 9. I learned a lot through the capstone courses.		25	13.3	3	- Approx. 59% have some degree of agreement that they learned a lot through capstone courses
	Premise 13. The discussion of the draft proposal and report with my teacher helped me learn from my mistakes.		17.3	5.4	6.9	- Approx. 70% have some degree of agreement that discussing drafts helped them learn from their mistakes
	Premise 16. I like research.		22.6	9.8	8.8	- Approx. 59% "agree" that they like research.
	Premise 25. I liked capstone!		38.5	9.3	7.6	- Approx. 45% "agree" that they liked the capstone course
Relevance	Premise 3. I already mastered the discussed topics.		49.2	28.3	6.2	- Approx. 49% "partially agree" that they mastered the topics discussed in the course
	Premise 8. Research skills are only important if I want to do a master's or doctorate.		2.4	14.7	76.2	- Approx. 76% recognize that research skills are not only important for masters and doctorates
	Premise 17. I would have preferred that my degree did not have this requirement.		12.6	25.1	52.2	• Approx. 52% value the capstone requirement in degree
Preparation for the thesis	Premise 5. When I started capstone, I had already made contact with a mentor.		7.2	3.7	15.1	- 74% have some degree of agreement that they had contacted a mentor at the beginning of the course

CATEGORY	PREMISE	Agree (%)	Partially Agree (%)	Partially Disagree (%)	Disagree (%)	Summary of findings
	Premise 11. The capstone course requires more time and effort than a traditional course.		35.4	15.7	5.8	- 43% have some degree of agreement that capstone requires more time and effort than a traditional course - Approx. 53% had research experience at the beginning of the course - Approx. 51% used the optional resources available in Moodle. - Approx. 51% used the available supplemental resources.
	Premise 14. When I started the capstone course, I had no research experience.		10.7	16	52.7	
	Premise 23. I did not use the optional supplemental resources available on the course's Moodle page.		14	23.1	51.3	
traditional vs online	Premise 6. The face-to-face workshops and the online activities complemented each other appropriately.		30.9	10.1	5.8	- Approx. 53% "agree" that face-to-face workshops and online activities complement each other adequately
	Premise 7. The use of the Moodle platform negatively affected my performance in the course.		14.3	24.5	60	- 60% did not consider themselves affected by the Moodle platform in their performance in the course
	Premise 10. If I had to choose between a traditional course and a hybrid (partially online) one, I would choose the traditional modality.		20.9	26.4	30.2	- The distribution of preferences towards taking traditional or hybrid courses was mixed. These data are prior to the COVID-19 pandemic. - Approx. 52% "agree" that I had enough technology skills for the course - Approx. 93% value the need for technology skills in their professional future
	Premise 12. The technological skills I had were sufficient to perform		34.2	10.1	4.2	

CATEGORY	PREMISE	Agree (%)	Partially Agree (%)	Partially Disagree (%)	Disagree (%)	Summary of findings
	satisfactorily in the course.					- Approx. 67% find the Moodle platform easy to use
	Premise 19. Skills in handling technology are not necessary in my professional future.		0.7	3.2	93.2	
	Premise 21. The Moodle platform is not easy to use.		10.7	19.1	66.8	

Appendix 5

Summary of findings from the graduate surveys administered in the years 2014-2020.

1. Currently, do you study or work?

Year	% Study	% Work	% Both	% None	% Other
2015	62	5	17	10	6
2016	71	13	4	8	4
2017	59	10	21	3	7
2018	67	33	0	0	0
2019	41	11	11	11	26
Average	**60**	**14**	**11**	**6**	**9**

2. Do you consider that the Bachelor of Natural Sciences-Interdisciplinary Studies contributed to your professional development?

Year	% Yes	% No
2015	98	2
2016	100	0
2017	100	0
2018	100	0
2019	100	0
Average	**100**	**0**

3. Would you recommend this baccalaureate to other persons?

Year	% Yes	% No
2015	95	5
2016	92	8
2017	100	0
2018	100	0
2019	94	6
Average	**96**	**4**

4. Examples of comments regarding strengths and weaknesses of the program.
A few representative comments were selected for each year the alumni survey was administered. The comments in each row of the columns do not correspond to the response of the same respondent. The year to which the comment corresponds is indicated in parentheses. The comments represent verbatim quotes from the surveys, no corrections have been made to the lexicon, or to spelling or typographical errors.

Program weaknesses (survey year)	Strengths of the program (survey year)
It has caused me some difficulty, due to the interdisciplinary nature of the program, learning to focus on one area of health and being an expert in it. (2014)	You can focus the baccalaureate towards the area within the sciences that you prefer. Capstone, oh Capstone! Even though you whimper when you're doing it, you learn a lot during the process and the fact that you've made a poster is something that helps a lot for graduate school admissions. The treatment in the department office does not compare to ANY other within the College. (2014)
When selecting courses, it was very difficult for us to get classes because they did not give us priority in any department (especially biol) when their classes were also a requirement for us. It should have sections, or at least space within sections, set aside for us just like students in other departments have. (2014)	flexibility to select courses in areas other than the natural sciences would not have found my love and passion for Public Health and would not find me where I am right now. (2014)
Direct the student in which professional fields can be performed with the obtaining of the same; since if the student decides not to continue their graduate studies, they would find themselves in the middle of nowhere. (2015)	I liked it! I found the capstone part very helpful. The only thing is that you have to guide the students to look for researchers from the beginning and work with them before asking them to allow them to do capstone, since they train you and spend their resources on you and sometimes some students do not continue researching and they are resources that the researcher sometimes does not see fruitful. Other than that, all very good! (2015)
It is a good program but it does not have the recognition that other Baccalaureates have with traditional degrees. (2015)	The program encourages the creation of inter and transdisciplinary knowledge in students, so that students graduate and demonstrate a broad vision of science, research and how they are a fundamental part of many disciplines. (2015)
It seems to me to be an excellent and flexible curriculum. However, it would be very nice to have access to be able to opt a second concentration. (2016)	The program allows free construction of the degree and that is a strength. It should improve in terms of providing options according to the path to take. Some series of general courses that guide to request "x" career but supplemented with courses that

	allow strengthening the interdisciplinary character that is so important. I propose a selection of courses that interconnect with the particular career, orienting to exponentiate the profile. In this way, the student has a map to direct himself and not just get carried away by particular requirements of some school and become a one-dimensional graduate. (2016)
Weaknesses: Not everyone knows about the program, it needs to be promoted more. (2016)	Strengths: I liked the good and individualized treatment that they offered to the students. The help that the Capstone professors gave when helping and correcting the writing of the investigative work. (2016)
Include courses that help the student prepare for the Capstone requirements, such as a course where the search for information in databases is put into practice, such as citing in APA or another format, statistical programs, among others. (2017)	The research project is a strength since you learn to work under an organized process. also, its interdisciplinary nature helps to expand your knowledge in more than one area and helps you to explore other fields at university. (2017)
Offer more courses that require more teamwork. Offer online courses. Give more workshops on databases. (2017)	Strengths: It is great that they take you by the hand or simply give you the platform to develop in what you like and do not judge you for the same. That you don't have to comply with a specific stereotype of what a biology student should be like. It's great that they embrace diversity and support universal knowledge, since that's the reason to go to university. I love that I have learned everything by taking various courses in science and have made my degree unique and personal. (2017)
Weakness: In the future they should provide resources as expert lecturers in different areas of interest to students. In this way, students can be better oriented and prepared according to their interest. (2018)	The Interdisciplinary Studies Program allowed me to direct my curriculum towards my goal, to study medicine. The capstone course was essential in my development as a scientist and future doctor, as it helps me think critically and highlights the relevance of research. (2018)
I understand that some classes should be given as part of the curriculum that prepare the student to prepare reports, portfolios, CVs and perhaps, professionalism. (2018)	Strengths: Flexibility, direction, focus on research. (2018)

Only if you continue graduate studies can you be a professional. The baccalaureate is a good base to continue studying. It is not a baccalaureate that will open doors to jobs, but it will open doors to master's degrees and doctorates. (2019)	It gave me a holistic view of science. At the same time, it gave me the freedom to choose classes to my liking within the scientific field, allowing me to discover my passion. (2019)
Capstone can have its complications depending on the mentors and the projects chosen, although, fortunately, the teachers are very understanding if something goes wrong. (2019)	The program gave me the flexibility to take courses that interested me within the requirements of degree and graduate schools. It allowed me to take more holistic courses in and out of the natural sciences. In addition, the CAPSTONE requirement encourages you to develop writing skills at the paper level. It also reinforces our research skills. The requirement to take the environmental science course helped me become more ecologically aware and see how it relates to the biological sciences (which I study at a higher rate) (2019)

5. Examples of comments from surveyed graduates and their relationship to the training categories identified for the program. The comments represent verbatim quotes from the surveys, no corrections have been made to the lexicon, or to spelling or typographical errors.

CATEGORY	Year	COMMENTS
Vocational training	2014	As its name says, the fact of being interdisciplinary is, I would dare to say, its greatest strength. In these times, not only is it sought for a person to know a lot about one subject, but about several, being a complete professional person.
	2015	It gave me the opportunity to be able to choose the prerequisite courses for my graduate studies and to be able to educate myself in subjects from all concentrations in Natural Sciences and other faculties, which I consider crucial for the formation of a complete and successful professional.
	2015	Nowadays, to continue graduate studies in Science, it is recommended to have an interdisciplinary education, and the program offered me the opportunity to adjust my baccalaureate to what was going to be my long-term professional goal. Not only did he help me in my professional goal, but he guided me. If I had the opportunity to go back in time and choose a degree again, I would have chosen it again.
	2015	The professional approach provided by this program allowed me to receive training in line with my interests in Biological Anthropology. Having been able to take courses that gave me the knowledge to be able to aspire to graduate studies in this branch, served as the basis to be able to pursue that goal. In addition, it should be noted that this program allowed me to have a guided research experience. And today that work has borne fruit because it helped me to strengthen my interest in what I wanted to study, to stimulate scientific thinking, it

		opened doors for me to enter graduate school and allowed me to have my first publication, since it will appear in the magazine Ingenios .
	2015	BEING INTERDISCIPLINARY, I HAD MORE OPTIONS WHEN IT TIME TO CONTINUE GRADUATE STUDIES
	2015	Thanks to this program I had the opportunity to present my research "Estradiol administration after Spinal Cord Injury enhances white matter sparring" in different forums such as oral presentations (50th ACS Junior Technical Meeting & 35th PR Interdisciplinary Scientific Meeting at UPRRP), and poster exhibitions (IX Congress of Research and Academic Creation at UPR Carolina; and 35th Annual Research and Educational Forum at RCM). In the latter I had the honor of receiving a cash prize, being the winner in the "Basic Science" category. All these experiences contributed to my professional and student development, applying new concepts and skills learned in each of my presentations, including the CAPSTONE.
	2016	The program provides the opportunity to take the courses of our own interest, and in this way, we are not forced to take courses from a single department. In turn, the interdisciplinarity of the program exposes you and helps you explore different fields of knowledge so that you can define the professional course you want to take in life. (2016)
	2017	It enriched me in experience and learning, especially with the Capstone Course. I had the opportunity to learn how to conduct research and gain knowledge. I am sure it will be very useful in my professional development. Thank you!
	2017	Immensely. I have been able to present my capstone work internationally and contribute to my "social network". It gave me the necessary tools to apply to graduate school. The fact that it is an interdisciplinary program has contributed to the knowledge of other subjects that perhaps in another degree it would not have done. Subjects that are necessary for the development of empathic citizens with society and the world in general.
	2017	The experience of doing the capstone helped me grow a lot professionally. I am taking great advantage of everything I learned during the capstone now that I have decided to continue my graduate studies.
	2019	It helped me to have broad knowledge of the different areas of science. Which helped me to be able to apply to different concentrations in graduate study.
Personal formation	2016	My baccalaureate contributed to my professional development in aspects of persistence, patience and handling of complicated subjects. The content itself is not very useful in the workplace since my focus is on the field of linguistics in English.
	2016	The interdisciplinary nature of the program allows for a graduate with a broader range of knowledge. This is imperative at the time of interviews for schools since our criteria goes through more points of view rooted in different disciplines.
	2016	The interdisciplinary approach helped me to the extent that now I look at things from different perspectives and facets.

2016	The degree helped me especially in the development of the experiences under investigation and that opened up paths that I had not thought of and new opportunities that I am currently taking advantage of.
2017	Having as a future profession one that requires experience in laboratories, research, teamwork, among other responsibilities... This program helped me develop communication skills, create critical and organized thinking and, above all, have responsibility. In addition, this program is totally efficient when it comes to choosing a career for the future, since you have the opportunity to design the courses you want and need to develop as a professional, but also meet the requirements of said program.
2017	It allowed me to develop leadership, communication and research skills.
2017	It strengthens interdisciplinarity, self-growth and exposes you to scenarios that you will experience in graduate schools and/or in professional work environments. And more than anything, the Capstone makes this degree stand out, gives it something unique, and is the best choice if you are considering post-graduate studies in the field of science and health.
2017	It helped me develop better. Also, to be able to decide what I wanted to do in the future.
2017	It helped me develop personal characteristics: values, perseverance, humility, commitment, optimism and organization to be a better professional. In addition, it helped me to be flexible, to have initiative, to develop myself as a leader and in the ability to work in a team.
2018	It contributed to my personal development more than professional.
2018	helped me get a job.
2019	Not only did I leave with a vast knowledge of science, but it helped me develop as a person, entrepreneur and professional.

Appendix 6

Development plan

Year 2013 to 2018

Program: **CNEI**

Priority areas:

1. **curriculum**

a. Creation of new courses that allow students to be trained to strengthen research skills from their entry and first years in the program

b. Integrate research experiences for the *capstone course* through collaborations with foreign universities

c. Continuation of the Student Learning Assessment Plan

d. Creation of an electronic page for the dissemination of *capstone projects*

e. Translation into Spanish of the electronic page of the program

2. **Students**

a. Evaluation of retention in the Program

b. Analysis of the contribution to retention and graduation rate of the College of Natural Sciences

C. Graduate Study

3. **Recruitment**

a. Bring at least two (2) College members to the program for new course development, offering *capstone experience,* and writing proposals for external funding, among other tasks.

goal 1 **Where do I propose to be with respect to this priority area?** **Having achieved the creation of courses aimed at the populations of new income and first years of degree, the development of oral and written communication skills in both English and Spanish, the strengthening of computer culture and the continuation of the Student Learning Assessment Plan.**					
Goal ***What specifically do I want to achieve to reach the proposed goal?***	**Strategy/ Exercise** ***What am I going to do to achieve this goal?***	**Deadline** ***On what date is it projected to meet this objective?***	**Responsible staff** ***Who are the resources or units in charge?***	**Necessary resources** ***What is required to achieve the objective through this strategy or activity?***	**progress indicator** ***What tells me that I achieved what was proposed?***
Promote the development of skills in the students of the program including the achievement of: a. **the creation of new additional *capstone courses* that promote the development of research skills during the first years of degree** b. **the integration of**	1. **Create courses.** 2. **Submit courses to the Academic Affairs Committee of the College** 3. **Achieve coding of courses.**	1. **August-December 2014** 2. **January-May 2015** 3. **May 2015**	1. **CNEI Director** 2. **CNEI director or representative to the CAA** 3. **Vice Presidency of Academic Affairs, Central Administration UPR**	**Adequate distribution of time.** **Meetings with the CAA committee**	**Course coding**

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research experiences for the capstone course through collaborations with foreign universities	4. **Follow up on preliminary conversations with universities that attend the orientation fair coordinated by the CNEI about the initial sponsorship of one (1) student of the capstone course per institution so that they can carry out the experimentation stage of their project as part of a summer internship experience.** 5. **Creation and offering of a *capstone section* for interviewed students who demonstrate the ability to write their proposal and**	4. **2014-2015** 5. **2014-2015** 6. **January-May 2015**	4. **Director of the CNEI and teaching contract- liaison with participating institutions** 5. **Director of the CNEI and teaching**	**Meetings with the Affairs Committee between the director of the CNEI, FCN and UPRRP staff, and staff from participating institutions.** **Full-time teaching contract.**	**Discussions of the document of the review and updating of the proposal for a new degree and the CIEPA report. ECA agreement. Approval of the curricular change.** **Data collection and analysis. Generation of reports for the EOAE**

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	perform effectively using the English language. 6. **Student interview and enrollment.** 7. **Selection of participants by collaborating institutions.** 8. **Project sponsorship by institutions. Said sponsorship includes mentoring during *Capstone* 1 and sponsorship of the student by the collaborating institution to carry out the proposed project.**	7. **October-November 2014** 8. **November - December 2014** 9. **January-August 2015**	**contract- liaison with participating institutions** 6. **Director of the CNEI, Teaching contract- liaison between participating institutions and representatives of the institutions**	**Call for participation and coordination of interviews.** **Memorandum of understanding between**	

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c. **Continuation of the Student Learning Assessment Plan.**	9. **Visit of the mentors of the collaborating institutions during the exhibition of the posters of their projects in the Capstone 2 course of the first semester 2015-2016.** 10. **Compilation of the data required for the assessment of the skills identified in the Plan.** 11. **Creation of template for the electronic page.**	10. **November 2015** 11. **2013-2018**	7. **Director of the CNEI, Teaching contract- liaison between participating institutions and representatives of the institutions** 8. **Director of the CNEI, Teaching contract- liaison between participating institutions and representatives of the institutions**	**UPRRP and participating institutions.** **Institutional support for the transfer of mentors from collaborating institutions.**	

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d. **Creation of an electronic page for the dissemination of *capstone projects***	12. **Selection of College members for the editorial board.** 13. **Selection of reports to publish.** 14. **Transfer of selected reports to the electronic repository of the College library.** 15. **Page launch.** 16. **Hire a translator for the page through additional compensation.** 17. **Launch of the page in Spanish.**	12. **2013-2014** 13. **2014-2015** 14. **2014-2015** 15. **2015**	9. **CNEI Director, Teacher-Assessment Coordinator Contract** 10. **Director CNEI and "Webmaster" Library College of Natural Sciences (FCN)** 11. **CNEI and FCN teaching staff** 12. **page editorial board**	**Access to Campus database.** **Meetings between CNEI Director and FCN "Webmaster"**	

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e. **Translation into Spanish of the electronic page of the program**		16. **2015** 17. **2015-2016** 18. **August – December 2016**	13. **page editorial board** 14. **Editorial board of the page and "Webmaster" FCN Library** 15. **College member with additional compensation** 16. **CNEI Director, FCN "Webmaster" and Teaching Member with**		

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			additional compensation		

Goal 2 **Where do I propose to be with respect to this priority area?** **Having evaluated the retention and graduation rates in the Program and in the College of Natural Sciences, in addition to completing a study of graduates.**					
Goal ***What specifically do I want to achieve to reach the proposed goal?***	**Strategy/ Exercise** ***What am I going to do to achieve this goal?***	**Deadline** ***On what date is it projected to meet this objective?***	**Responsible staff** ***Who are the resources or units in charge?***	**Necessary resources** ***What is required to achieve the objective through this strategy or activity?***	**progress indicator** ***What tells me that I achieved what was proposed?***
1. **Know the retention and graduation rates of the program and the College.** 2. **Carry out a study of Program graduates to measure the effectiveness of the program and follow its recommendations to improve and keep the CNEI up to date.**	1. **Evaluate the retention and graduation rates of the program and of the College, distinguishing between the students who enter the Program from their first year of studies and those who reclassify it.** 2. **Keep the database of active students and graduates up to date** 3. **Preparation of questionnaires** 4. **Distribute questionnaires**	**1- 2013-2014** **2- 2013-2018** **3- 2014-2015** **4- 2015-2016**	**1-Director and staff of the CNEI, Office of Academic Planning and Registrar.** **2- Director and staff of the CNEI** **3- CNEI Director and CNEI staff** **4- Director and staff of the CNEI**	**Access to Campus database.** **Adequate computers and programs, available and trained personnel to enter data and analyze it.**	**Tables, graphs and data analysis.** **Graduate database** **Generation of questionnaires.** **Analysis and publication of results of the questionnaires**

	5. **Analyze the collected data.**	**5- 2016-2017**			

Goal 3 **Where do I propose to be with respect to this priority area?** **Achieve the assignment of at least two (2) additional teaching positions in the Program.**					
Goal ***What specifically do I want to achieve to reach the proposed goal?***	**Strategy / Exercise** ***What am I going to do to achieve this goal?***	**Deadline** ***On what date is it projected to meet this objective?***	**Responsible staff** ***Who are the resources or units in charge?***	**Necessary resources** ***What is required to achieve the objective through this strategy or activity?***	**progress indicator** ***What tells me that I achieved what was proposed?***
Achieve the assignment of at least two (2) additional College members to the CNEI Tener for the development of new courses, the offering of the *capstone experience* and writing proposals for external funds, among other tasks.	**Present the need for teaching support to the pertinent instances in the Campus.** **Monitor the assignment of teaching staff.**	**2013** **2013-2015**	**Budget Office, Human Resources and Campus Rector.**	**Request for authorization to start the recruitment or transfer process.** **Recruitment authorization or job transfer.**	**Recruitment.**