

TECHNOLOGY CONSULTING

IN THE GLOBAL COMMUNITY

Final Consulting Report

Peru SENATI

Gabriel Sims

August 2024

Carnegie Mellon University





Executive Summary

Student Consultant, Gabriel Sims
Community Partner, SENATI

I. About the Organization

SENATI (Servicio Nacional de Adiestramiento en Trabajo Industrial) is the major vocational school of Peru, offering technical training since 1961. It was created by the National Society of Industries to meet high labor demand. Since then, SENATI has expanded to meet the needs of over 150,000 students yearly across the country. The institution is led by National Management and a National Board of Directors, spanning 13 demarcation zones which cover the country.

Their mission,

To train innovative and highly productive technical professionals (Formar profesionales técnicos innovadores y altamente productivos)

emphasizes a commitment to student development while uplifting Peru.

SENATI has many information systems including Banner, where student data is input and stored, and APEX, where custom tables can be extracted. All systems run on Windows.

The student consultant for this consulting period has been placed in the development department of the National Management in Lima.

II. Increasing Data Accessibility for the Development Department: Live and Interactive Power BI Report

Timely acquisition of verifiable statistics is crucial to the development department for reporting, but has historically been difficult, often taking weeks to obtain a single figure. Securing future partnerships and managing current ones can be done strategically with quantitative metrics. APEX outputs .csv files given periods, locations, or IDs for numerous dropdown selections. Staff unfamiliar with software and statistics found difficulty determining KPIs from APEX outputs.

The output of this consulting project is an interactive Power BI report containing student data since 2014. It is directly connected to information systems and can be easily updated during new academic periods. The Power BI report is located in the Desarrollo BI folder with a manual and

other relevant files. I recommend all staff read the manual. The outcome of this project is a decrease in KPI acquisition time from weeks to minutes.

Risks to sustainability for this output must be discussed:

- Viewing

The Power BI report can be viewed in the desktop application or web service. The web service looks cleaner but after 60 days requires a Power BI Pro license.

- Source File Maintenance

Some files are sourced from the account gsims which will be blocked after the consulting period. If any source file issues arise, the Desarrollo BI folder contains instructions and duplicate files.

- Constrained KPIs

Time constraints caused not all KPIs to be completely actualized. Such KPIs are described later in this report with instructions on how to complete actualization in the manual.

- KPI Reliability

Although KPIs are sourced from SENATI information systems, many have not been formally verified. If any figures look amiss, I recommend staff to compare KPI logics.

- Updating Data

New scholarship descriptions may be created for every new period. Their categorization must be done manually by staff and input into Power BI.

I recommend the standardization of scholarship descriptions in Banner. Descriptions are inconsistent and frequently different for the same scholarship during different academic periods. Description standardization would increase ease of categorization for staff when updating and aid future data projects with scholarship students.

Consulting Partner

SENATI
rmoreno@senati.edu.pe.

SENATI
Av. Alfredo Mendiola # 3520 Independencia, Lima.
http://www.senati.edu.pe

About the Consultant

Gabriel Sims
gsims@andrew.cmu.edu

Gabriel is a junior studying Decision Science. He will return to the United States to continue his education after experiencing Peru.



Final Consulting Report

Student Consultant, Gabriel Sims
Community Partner, SENATI

I. About the Organization

Organization

SENATI (Servicio Nacional de Adiestramiento en Trabajo Industrial) is the major vocational school of Peru, offering technical training since 1961. It was created by the National Society of Industries to meet high labor demand. Since then, SENATI has expanded to meet the needs of over 150,000 students yearly across the country.

Their mission,

To train innovative and highly productive technical professionals (Formar profesionales técnicos innovadores y altamente productivos)

emphasizes a commitment to student development while uplifting Peru.

Facilities

SENATI campuses span 13 demarcation zones encompassing the country. Facilities differ greatly by campus but all contain SENATI's distinct blue and white colors. The central location in Lima offers students a variety of machines, classrooms, walkways, gardens, and sports facilities next to an 8 story building containing the National Management and other offices.

Programs

SENATI offers primarily 3-year technical degrees in 70+ areas including Industrial Administration and Automotive Mechanics. Students have access to machines and software, and frequently achieve in national and international competition. There is a popular preprofessional training program, where students can work for a company during their career at SENATI. After graduation, students receive high insertion in the labor market.

Staff

National Management and a National Board of Directors lead SENATI. Each demarcation zone has a zonal management and board of directors. There are 10 functional departments, managing academics, marketing, development, human resources, finances, information technology, infrastructure, law, commerce, and logistics.

The development department (desarollo) contains 8 specialists, an administrative assistant, and manager. All staff have Microsoft 365 and Windows operating systems.

Technology Infrastructure

Information systems on Ellucian Cloud and software applications for students comprise the main technology infrastructure of SENATI.

Ellucian Cloud houses most infrastructure used by staff:

- **Banner**

Banner holds student information input by demarcation zones. Locating data requires knowing many keys, making data analysis use limited. Rather, other platforms offer views of Banner data. Banner is an SQL server.
- **APEX**

Oracle APEX provides users dropdown selections to view customized Banner tables. It was implemented over 15 years ago. Many selections require parameters such as period, location or ID. Users can only view selections to which they are granted access. The account I am using has drop down selections in categories Multiple Reports, Financial Reports, Operation and Budget Plans, Human Resource Operations, Ex Student Operations, Academic Reports, and Student Operations.
- **JD Edwards**

JD Edwards, like APEX, provides users access to Banner tables. JD Edwards contains financial information and was implemented May 2022.
- **Plus**

Plus is a newer application, and provides search functionality by ID. Plus is run with JavaScript.
- **BlackBaud**

Blackbaud contains academic information. It is a platform to manage courses and grades. Academic information from Blackbaud is then input into Banner.
- **Power BI**

Power BI is a microsoft application that creates interactive data dashboards and reports to display KPIs. Reports are made by IT analysts at the request of staff. DataMart, a view of the SQL database, directly connects tables to Power BI. Report access can be granted at the departmental or individual level. The Power BI strategy was implemented last year.
- **GLP / Cusu**

GLP or Cusu is the IT ticketing system for staff at SENATI. Its user interface could be improved, FAQ may be outdated, and has been described as difficult and slow. Staff opt to request through email often, but this system is still used. Recent large access grants have decreased requests from ten a month to one or two. PowerBI dashboard and report requests are initiated here.

- Intranet

Intranet used to function as a guide for technology resources, but as SENATI developed it became outdated and redundant.

- Sinfo Administrator

Contains student data.

Ellucian Cloud lacks a manual and does not contain all applications which should be housed there:

- Siseg

Siseg is an application unique to the academic department. It manages data for students during the preprofessional training program.

- Navajo 360

Navajo 360 is an application unique to the academic department that offers geographic viewing of student employment. Other staff had expressed interest in the capabilities of this software, but were unaware of its utilization.

Students have access to many software applications, including Bibliotec, Canal Youtube, Electude, Cisco Networking Academy, SAP University Alliances, Adobe Products, Audaces, WGSN, Labor Board, and an IT Ticketing System.

Technology Management

Technology is managed by the IT department and contracted companies. IT staff are categorized into infrastructure, project management, application development, functional analysts, and technology support. Some processes are automated while some remain manual. The department manager is responsible for budgeting and planning.

Contracted companies are used to varying capacities in SENATI. Direct code and data is usually inaccessible with software created by a contracted company:

- System of Contributions

SENATI is a public institution with private status. The System of Contribution manages tax payer data.

- UPlanner

UPlanner has an algorithm that categorizes student dropout risk as low or high. This was a 5 year contract ending this year and is the focus of the consulting project of the other student consultant.

- Red Logic

Red Logic provides support with application development and has been used for 3 to 5 years. Red Logic helped implement JD Edwards.

- Evotech

Evotech provides support with database maintenance and has been used for 3 to 5 years.

- TeleCom

TeleCom provides support with data security and has been used for 3 to 5 years.

- Talent Studio

Talent Studio provides support in updating Power BI data.

- Carat

Carat is a company working with the Marketing Department to develop a predictive model of clients. With coordination this may be an area of potential partnership between SENATI and Technology Consulting in the Global Community.

Communication

Most communication is done through Teams, Outlook, or WhatsApp. Interdepartmental communication isn't typical within SENATI's organizational system, often leading to unanswered emails and long wait times.

II. Increasing Data Accessibility for the Development

Department: Live and Interactive Power BI Report

Motivation

Timely acquisition of verifiable statistics is crucial to the development department for reporting, but has historically been difficult. Although technology infrastructure at SENATI is large and substantial, accessing and summarizing data takes too long and is done through informal channels. Figures like the current number of instructors takes weeks to obtain after multiple chains of email correspondences and referrals.

Early 2024, Sr. Carlos Hernandez granted the department access to APEX to improve monthly reports and general data usage. Scholarships, sponsorships, donations, events, competitions, and employment attract and facilitate student growth. These opportunities allow students to develop professionally as productive and innovative laborers. Securing future partnerships and managing current ones can be done strategically with quantitative metrics. APEX outputs CSVs given periods, locations, or IDs for numerous dropdown selections. Staff unfamiliar with software and statistics found difficulty determining KPIs from APEX outputs.

Outcomes

The outcome for this goal is the Desarrollo BI folder with .pbix Desarrollo Power BI Report and .docx manual. The folder also contains source file backups and transcribed development process notes.

Project Scope

Department staff had a clear picture of an interactive report using Power BI with data from the past decade, and presented a list of KPIs with a timeline of work for the project. Quantity of KPIs in the final report is the best observable metric for report success.

KPI Categories:

- General Indicators
- Sponsored Students
- Admissions Process
- Education Process
- Scholarship Students
- Internship & Job Process
- Instructors

Power BI Models

Power BI Dimensional Model

After understanding Power BI, a cohesive model was developed to combine APEX extractions. This contained all data accessible in the APEX selection corresponding to KPI categories of

- Internship & Job Processes
- Scholarship Students
- Admissions Process
- Sponsored Students
- General Indicators

An additional page with educational, sponsorship, and scholarship information by student ID was constructed since the data existed in the model. A glossary page with the code for all measures, errors, source information, and data available in the model was added.

Final Power BI Report

The final Desarrollo Power BI report contains a mixture of data extracted from APEX and direct connections to the SQL DataMart view, a filtered view of the Banner server, where data is input and housed. This product is discussed more in detail following the limitations and is viewable in the Desarrollo BI folder.

Data in the Final Model

Specifics on using Power BI, data model construction, and updating the report are discussed in detail within the manual. The final model contains data for students since 2014. Data from years 2019 to present has been extracted through DataMart.

The report contains standard pages for

- Enrolled Students
- Overview of Scholarship Students
- National Scholarship Program Students (PRONABEC)
- Company Funded Scholarship Students (Economic Sectors)
- Local Government Funded Scholarship Students (Gobierno Local)
- Other Scholarship Students
- Sponsored Students

and drillthrough pages for

- Period
- Gender
- Scholarship Description

KPIs categories completed in the report with high reliability:

- General Indicators
 - Number of Students
 - Number of Students Male and Female
 - Number of Students per Campus
 - Number of Scholarship Students
- Sponsored Students
 - 10 Year History of Sponsored Students
 - Careers Selected by Sponsored Students
- Scholarship Students
 - Number of Scholarship Student per Campus and Gender
 - Number of Retired Scholarship Students
 - Careers Selected by Scholarship Students
 - 10 Year History

KPIs viewability in the model with reliability constraints. Instructions on how to fix constraints are described in the manual:

- Education Process
 - Career Changes (Needs Data Modeling Work)
 - Grades (Needs Data Modeling Work)
- Scholarship Students
 - Number of Entering Scholarship Students (Needs Data Modeling Work)
 - % Type of Scholarships (Needs Staff Research and Power Query Work)
 - Number of Scholarship Students by Type (Needs Staff Research and Power Query Work)

KPIs not currently viewable in the report. Instructions on how to integrate are described in the manual. Initial Power BI Sample Pages for Admissions Process and Internship & Job Processes are viewable in the Desarrollo BI folder.

- General Indicators
 - Number of students by age range (Needs Visual Work)
 - Annual economic cycles (Inaccessible Data)
- Admissions Process (Eliminated KPI by Staff, but data has been imported)
 - Number of Applicants (Needs Power Query Work)
 - Number of Applicants per Campus (Needs Power Query Work)
 - High Schools of Applicants (Needs Power Query Work)
 - Number of Applicants by Gender (Needs Power Query Work)
- Education Process
 - Number of Years to Complete Career (Needs DAX and Power Query Work)
 - Enrolled / Admitted Students (Needs DAX Work)

- % of Practicing Students (Needs DAX Work)
- National and International Competition (Inaccessible Data)
- Scholarship Students
 - Economic Revenue by Scholarship Type (Inaccessible Data)
 - High School's for Scholarship Students (Needs Visual Work)
- Internship & Job Processes (Unreliable Data)
- Instructors (Eliminated KPI by Staff, Inaccessible Data)

Sustainability Risks

All APEX source files are connected to the user gsim. IT expressed that as I leave, the account will be blocked rather than deleted. However, reliability of APEX data is constrained if these files are compromised. If errors from source files arise, copies and instructions are present in the Desarrollo BI folder.

Accurate scholarship student information is contingent on accurate scholarship categorization. More details on this process can be found in the manual.

Data is connected directly to or sourced from SENATI information systems but has not been formally checked for reliability.

Impact

The Desarrollo Power BI Report reduces KPI acquisition time from weeks to minutes.

Interactive data is only viewable through Power BI in SENATI, and this service contains unique features:

- Enrolled student data can be looked at for multiple academic periods at a time, distinct from IT BI Reporting.
- Data dates back to 2014, 5 years more than IT BI Reporting
- IT BI Reporting reporting does not contain detailed information about scholarship students or sponsored students.

Calculated columns within the report offer grouping options I have not observed in any other information system.

- Grouping by CFP (central campus) rather than campus
- Categorization by scholarship type

The user manual provides development staff the ability to improve the system and generate new KPIs.

Recommendations

Scholarship description standardization and categorization may help future data utilization by the development department.

Normalization would ease the categorization of new scholarships necessary to ensure sustainability of this Power BI report.

Addressing this constraint at the root, in Banner, offers improved data flexibility for scholarship student data. Steps to achieve this recommendation could be pursued after discovering the specific

current naming protocol. Coordination with IT could develop a normalized and standardized system and coordination with demarcation zones could ensure implementation.

About the Consultant

Gabriel Sims is a junior studying Decision Science at Carnegie Mellon University. He will return to the United States to continue his education after experiencing Peru.

Appendix A. SENATI Staff Initial Presentation

Slides with the initial KPIs requested by SENATI staff at the beginning of the consulting period.

KPI Generales

Centralización de la información para mejorar la toma de decisiones

Indicadores esenciales para la plataforma	
Generales APEX	<ul style="list-style-type: none"> • N° alumnos • N° de alumnos hombres y mujeres (por rango de edades y sedes) • N° Ingresante por sede • N° de becarios • Ingresos económicos anuales/ ciclo (creo que Baner) • N° de instructores • N° de instructores hombres y mujeres (por rango de edades y sedes)



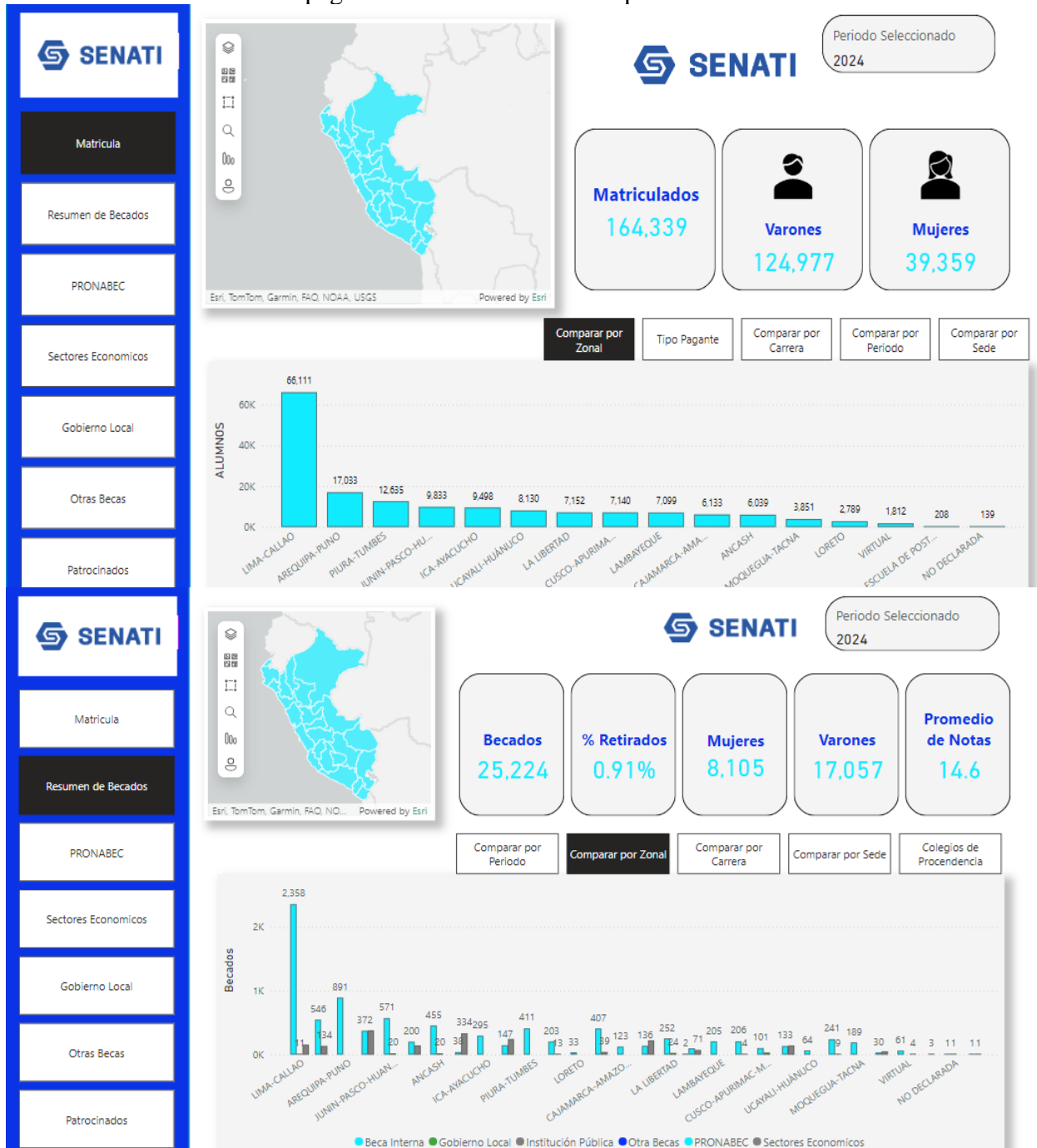
KPI Específicos

Alumnos patrocinados	<ul style="list-style-type: none"> • Histórico de alumnos patrocinados (10 últimos años) • Carreras seleccionadas por los alumnos patrocinados 	Becas asignadas	<ul style="list-style-type: none"> • N° becados por sede (categorizar varón y mujer) • N° de ingresantes becados • % de deserción en becados • % de tipo de becas • N° de becados por tipo de socio • Carreras elegidas por becarios • Colegios de procedencia de los becarios • Histórico de N° becarios por año (10 últimos años) • Ingresos económicos anuales generados por becas (histórico 10 años, tipo de socio, sedes)
Proceso de postulación	<ul style="list-style-type: none"> • N° de postulantes por año (10 últimos años) • N° de postulantes por sede • Colegios de procedencia de los postulantes • N° de postulante por género (varones y mujeres) 	Proceso de prácticas laborales	<ul style="list-style-type: none"> • Empresas con mayor demanda laboral (Bolsa de Trabajo) • % de inserción laboral de los estudiantes • Puestos solicitados (por sede y) • Puesto colocados • Puestos no colocados • Desacuerdo de colocación por remuneración
Proceso educativo	<ul style="list-style-type: none"> • N° de años en culminar los estudios por carrera • Cambios de carrera • N° de matriculados/ N° de admitidos • % de alumnos practicando • Promedio ponderado de notas Concursos nacionales e internacionales N° de alumnos ganadores de SENATI INNOVA por sede (histórico y por año) N° de alumnos ganadores de Olimpiadas Tecnológicas (sede, especialidad y por año) N° de alumnos que participaron Worldskills (ganadores, sede, especialidad y por año) N° de alumnos participantes de otros concursos internacionales (sede, especialidad y por año) 	Instructores	<ul style="list-style-type: none"> • Instructores por especialidad • Grado académico por instructores • N° de instructores en RENACYT • N° de instructores ganadores de SENATI INNOVA por sede (histórico y por año)



Appendix B. Screenshots of the Desarrollo Power BI Report

Screenshots of the standard pages of the final Power BI report.

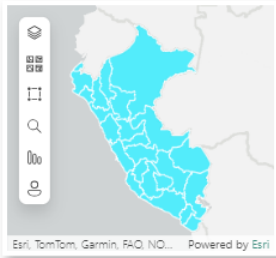


SENATI

- Matricula
- Resumen de Becados
- PRONABEC**
- Sectores Economicos
- Gobierno Local
- Otras Becas
- Patrocinados

SENATI

- Matricula
- Resumen de Becados
- PRONABEC
- Sectores Economicos**
- Gobierno Local
- Otras Becas
- Patrocinados



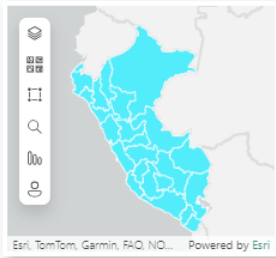
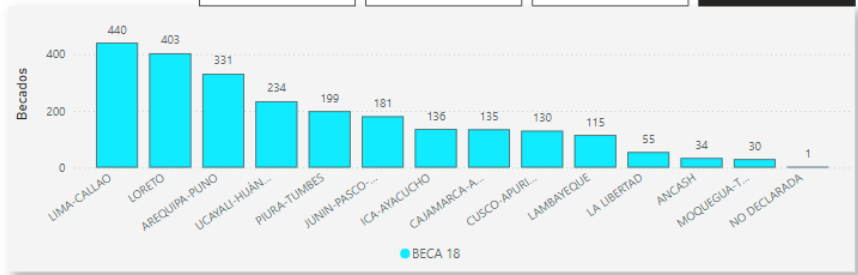
Resumen PRONABEC | Tipo PRONABEC | Perodo Seleccionado 2024

BECA 18 | CONTINUU... | Descuento | HIJO... | other | VOCACIO...

Becados 2,422 | **% Retirados** 0.37% | **Mujeres** 1,242 | **Varones** 1,179 | **Promedio de Notas** 14.6

Comparar | Descripciones Becas

Comparar por Perodo | Comparar por Carrera | Comparar por Sede | **Comparar por Zonal**



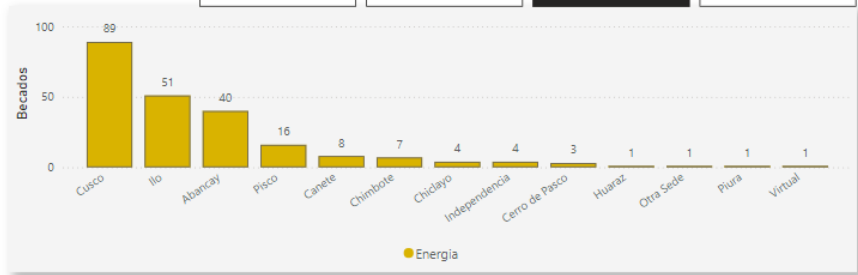
Resumen de Sectores | Tipos de Sector Economico | Perodo Seleccionado 2024

Agroindustria | BEBIDAS | Cosmeticos | **Energia** | Hidrocarburos

Becados 226 | **% Retirados** 0.44% | **Mujeres** 91 | **Varones** 134 | **Promedio de Notas** 14.6

Comparar | Descripciones Becas

Comparar por Zonal | Comparar por Perodo | **Comparar por Sede** | Comparar por Carrera



Filters

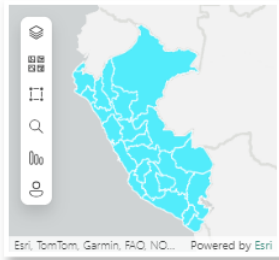
Filters

SENATI

- Matricula
- Resumen de Becados
- PRONABEC
- Sectores Economicos
- Gobierno Local**
- Otras Becas
- Patrocinados

SENATI

- Matricula
- Resumen de Becados
- PRONABEC
- Sectores Economicos
- Gobierno Local
- Otras Becas**
- Patrocinados



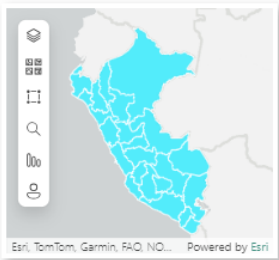
SENATI

Periodo Seleccionado
2024

Becados 105	% Retirados 0.95%	Mujeres 43	Varones 62	Promedio de Notas 14.6
-----------------------	-----------------------------	----------------------	----------------------	----------------------------------

Comparar Descripciones Becas

DESCRIPCIÓN_BECA	Becados	Becados by Ano	Sum of TARIFA
CONV MARINA 5/2016-19 10%	11	•	41,175.00
CONV MUNICIPIO HUARMEY 15%	20	•	32,900.00
CONVENIO MUNIC. SAN RAMON 50%	20	•	33,705.00
EMP MUNICIPALIDAD PARCOY	25	•	
MUNICIPALIDAD DE SAN JERONIMO	29	•	
Total	105	•	107,780.00



SENATI

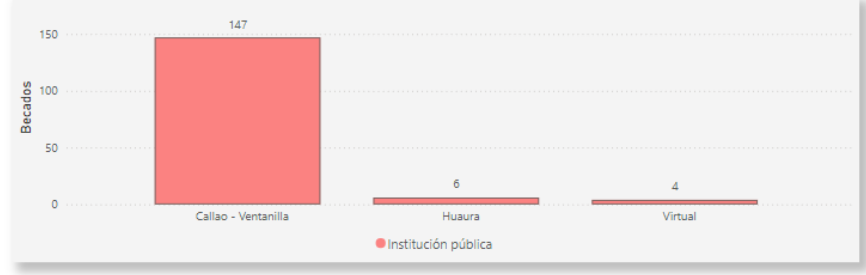
Periodo Seleccionado
2024

Select all Beca Interna **Institución...** No Aplica other

Becados 157	% Retirados --	Mujeres 52	Varones 105	Promedio de Notas 14.6
-----------------------	--------------------------	----------------------	-----------------------	----------------------------------

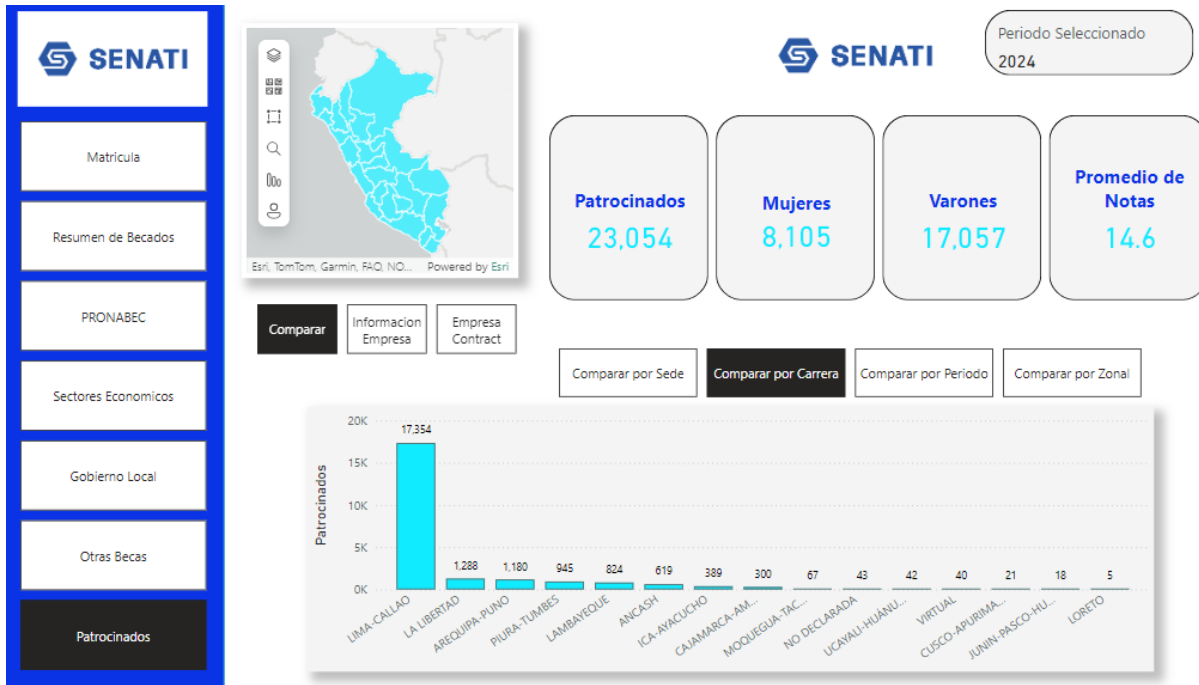
Comparar Descripciones Becas

Comparar por Periodo **Comparar por Sede** Comparar por Zonal Comparar por Carrera



Filters

Filters



Filters

Appendix C SENATI Marketing Materials

A site where many SENATI marketing materials are published, including yearly reports.

<https://issuu.com/senati1/>