Center-Level Portfolio: University of Puerto Mayagüez

The following table, proposed implementation plans by participating teachers, and when available other examples are intended to provide an overall narrative about how and in what ways program participation has influenced teachers in using QuarkNet content and materials in their classrooms (and in-after class events). The value of these qualitative reviews is to expand on the instructional practices measured quantitatively via Teacher Survey responses to specific sets of questions/self-reported by teachers providing narrative examples of implemented or planned instructional practices in teachers' classrooms and in schools. This evaluation approach is consistent with the use of *authentic assessment* to evaluate performance, "teaching for understanding and application rather than for rote recall" (Darling-Hammond & Snyder, 2000, p. 523).

In keeping with Darling-Hammond, Hyler and Gardner (2017), we do not naively expect a single workshop (or event) to have a measurable impact on teachers' knowledge and subsequent classroom implementation. A characteristic of effective professional development is a program of sustained duration, providing "multiple opportunities for teachers to engage in learning around a single set of concepts or practices; that is rigorous and cumulative" (Darling-Hammond, et al., 2017, p. 15). As such, the table summarizes responses by teachers over the course of several program years and likely several QuarkNet programs and/or events.

These responses come from the Teacher Survey (either the full or update version) where each row represents the responses to open-ended questions from the same teacher over time. Also, each row starts with the original responses to the first time a teacher completes his/her full teacher. If a particular box in the table is blank, it likely means that that teacher did not participate in an event for that program year (or, the center may not have had a major event that year). The table provides the essence of these responses; a given response, as presented, may be a direct quote, a paraphrase, or lightly edited; the intent is to convey the overall idea or its essence from that particular teacher.

Because these are responses to open-ended questions, teachers are free (and encouraged) to provide information that he or she thinks most relevant. Each highlighted response is intentionally anonymous to respect the principles of collecting evaluation data (*Guiding Principles for Evaluators*, American Evaluation Association) and to help encourage teachers to respond frankly to these questions. If a reader is familiar with a given center, it may be possible to "reverse engineer" the identify of a particular teacher. We encourage readers to respect this anonymity. At various times, we may have identified a given teacher by name and/or school; when this happens the written approval of that teacher has been obtained. It is also important to note that the full breath of a response by a given teacher may not be fully articulated in this table. For example, responses related to how QuarkNet may have advanced the knowledge of a given teacher or bolstered a collegial network among participants are likely discussed elsewhere in subsequent evaluation reports.

The table is followed by examples of implementation plans, and at times teacher presentations and student presentations when available. The intent of providing these examples is to deepen the narrative as to what and how teachers have planned (and have used) QuarkNet content and materials in their classrooms and in-after class events (e.g., Physics Club). Examples from Annual Center annual reports may be highlighted as well.

Table

Self-reported Use of Data Activities Portfolio Activities: Based on Responses from the Full Survey and then Responses from the Update Survey in Subsequent Years **University of Puerto Rice – Mayaguez Center**

Center	Program Year (Year of Full Survey)	Subsequent Program Year	Subsequent Program Year	Subsequent Program Year
University of Puerto Rico-Mayaguez	2019	2020	2021	2022
	Compared a cosmic ray received in the different climate zone.			
	In astronomy theme			
	Rolling with Rutherford			
	This year we used the muon detector with my students.		Explaining conservation and atomic particulars. Examples: Rolling with Rutherford and detectors	
	Conference information		Adrons and mesons puzzles; Rolling with Rutherford	
	Is part of my conference in atomic theory			
	Rolling with Rutherford			
	Rolling with Rutherford as an example to make histograms	He incorporado ejemplos de fisica de particulas en temas como conservacion de momentum, energia y fuerzas fundamentales. Pienso crear mas ejemplos y ejercicios utilizando codigos de python que aprendi Examples: He utilizado Rolling with Rutherford y Histogram the basics. Planifico utilizar otros.		
	Quark Puzzle	I will incorporate the activity of Particle Conservation (DAP) in the discussion of conservation and energy. Examples: A year ago I was able to identify a group of students interested in particle physics.		
	Presentation on atomic theory and Rutherford with Rutherford	Actualmente ofrezco el curso de Química y el la unidad 2 de mi curso incorporo todo lo aprendido en QuarkNet cuando ofrezco el tema de la Estructura Atómica, entonces actualizo mi curso integrado. Examples: La actividad de Roderford y programa de rayos cósmicos	I plan to incorporate the theme of Cosmic Rays in a Scientific fair project. Examples: Rolling with Rutherford, and cosmic ray information	He incorporado ejemplos de fisica de particulas en temas como conservacion de momentum, energia y fuerzas fundamentales. Pienso crear mas ejemplos y ejercicios utilizando codigos de python que aprendi. Examples: 1. Actividad de Rutherford. 2. Experimento de MINVERvA.
	Rolling with Rutherford, puzzle and card game	I incorporate QuarkNet informacion en todo el curso de Fisica. Exampes: Histograms, Rolling with Rutherford, jpsi decay, Mass of penny and STEP UP presentation.	Use QuarkNet for energy and momentum and nuclear fission. Examples: Rolling with Rutherford; making histograms.	All, I use all information Rolling with Rutherford, Coding, STEP UP.

Table
Self-reported Use of Data Activities Portfolio Activities: Based on Responses from the Full Survey
and then Responses from the Update Survey in Subsequent Years **University of Puerto Rice – Mayaguez Center**

Center	Program Year (Year of Full Survey)	Subsequent Program Year	Subsequent Program Year	Subsequent Program Year
University of Puerto Rico-Mayaguez	2020	2021	2022	2023
	Dice histogram and probabilities			
	Transformaciones de particulas			
	First year in QuarkNet. Plan to use activities.	Conservation of momentum, standard model vocabulary, STEP-UP resources. Examples: Shuffling of Particle deck, the case of the missing neutrino		
	Program Year (Year of Full Survey)	Program Year		
	2023	2024		
	Histograms and particle deck have been the most useful. Most recently i used the particle deck to introduce physics during the first week.	Deck of cards, rolling with Rutherford, histograms. QuarkNet is refreshing, every experience motivates me to continue teaching physics and keeps me up to date with current research and teaching practices.		
	the (coding) skills gained will be implemented in my Physics and Math courses			
	Learning coding language and putting it into practice in activities that can be implemented in the classroom.			
	Cambios d Temperatura, Astrofisica, Velocidad y Aceleracion, Maquinas Simples			
	Program Year (Year of Full Survey)			
	2024			
	The use of data in the Energy, mass and Momentum laboratory activity. I want to use that activity in order to introduce the student to real data and proper and accurate ways to manage the data. I would recommend the instructional materials because I find them quite interesting and practical for developing data analysis skills			
	Coding in Python to graph data sets and calculating the Line of Best Fit for a scatterplot. I would recommend these activities to any teacher seeking to integrate coding into their science and math courses. I would recommend these activities to any teacher seeking to integrate coding into their science and math courses. The approach used during QuarkNet training is ideally suited for teachers with a hands-on learning style. QuarkNet gave me the opportunity to interact with QuarkNet fellows and Physics teachers from all over the nation.			

Note: Each row presents responses from the same individual teacher from a given center. Empty table cells indicate that the teacher did not participate in QuarkNet in that subsequent program year(s). Or, less likely did not complete the Update Survey; or did not answer specific questions about the use of DAP activities in their classrooms. (Out of a total of 23 teachers.)

Presented on the next page are examples of proposed coding projects created by participating teachers who participated in a Coding Workshop in 2023. These examples are presented in Spanish and in English.

Table

Workshop Implementation Plans/Coding Projects Summer **2023**

University of Puerto Rico Mayagüez July 10-12, 2023[2]				
Project	Title (As written)	Brief Description (As written)	Title (English)	Brief Description (English)
1[a,b]	Introduction to Coding	Run and edit code in Python; reading code and running code in order.	Introduction to Coding	Run and edit code in Python; reading code and running code in order.
2[a,b]	Densidad	Determina la densidad de un objeto. Densidad es la relación entre la masa de una sustancia y el volumen que ella ocupa.	Density	Calculate density, mass, volume, and graph this relationship.
3[c]	Conversion de Temperatura	Tomar la temperatura del mismo cada minuto y generar una tabla de datos. Generar una grafica con estos datos.	Converting Temperatures	Converting Celsius and Fahrenheit temperature measures to Kelvin and graphing changes in temperature over time.
4	Libreta De Balanceo De Reacciones Quimicas	Balanceo de ecuaciones químicas pero utilizando el sistema operativo de Python.	Chemical Reactions	Balancing chemical equations using Python.
5[d]	Tipos de células[c]	Los estudiantes podrán identificar y describir las características de las células procariotas y eucariotas, así como las diferencias entre las células vegetales y animale	Types of Cells	Identify and describe the characteristics and the differences between prokaryotic and eukaryotic cells, and the differences between plant and animal cells.
6[e]	Conversión de números entrees a binarios y vice-versa[d]	Convierta un número entero en binario y converter un número binario en entero	Converting Numbers from Decimal to Binary and the Reverse	Converting decimal numbers into binary numbers and vice versa.

Note. [2]As posted as of July 14, 2023.

[a,b]Created by a team of four teachers.

[b]This team adapted and created two coding projects.

[c]Created by a team of teachers.

[d]Created by a team of three teachers.

[e]Created by another team of two teachers.

Table

University of Puerto Rico --Mayagüez

Coding Workshop June 24-26

Implementation Plans

Teacher	Title	Brief Description
1	Elements and the Periodic Table	Using data on various properties of elements (e.g., Atomic Numbers vs. Atomic Radius; Atomic Numbers vs. Electronegativity)
2	Conteo de Colonias Colony Counts	Una técnica fundamental en microbiología que permite la cuantificación de microorganismos presentes en una muestra. A fundamental technique in microbiology that allows the quantification of microorganisms such as bacteria concentration in different environmental samples.
3	Python Programming Introduction	Exploring how to: • Run and edit Python code • Read comments in Python • Run arithmetic exercises
4	Practica	Cofidficando en laboratories de Quimica Coding in Chemistry laboratories
5	Intro to Python and Future Project of Solar Position	A little bit of Python
	Solar Position	Graphing solar positions based on different angles at particular times and locations.
6	Plotting Data Sets	Creating data sets using Python and GitHub to support a valuable skill for physics students.
7	Elements and the Periodic Table	Using data on various properties of elements (e.g., Atomic Numbers vs. Atomic Radius; Atomic Numbers vs. Electronegativity)

Note. In-workshop projects include: Intro to Coding; Ifs and Loops; Dice & Probability; Modeling Position Graphs; Muon Mass. These projects were worked on by teacher groups of two or by individual teachers.