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Database Management System for BYUH Jonathan Napela Center

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DATABASE MANAGEMENT SYSTEM FOR BYUH JONATHAN NAPELA CENTER

A graduate project submitted to Dakota State University in partial fulfillment of the requirements for the degree of

Master of Science

in

Information Systems

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By
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PROJECT APPROVAL FORM

We certify that we have read this project and that, in our opinion, it is satisfactory in scope and quality as a project for the degree of Master of Science in Information Systems.

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Master's Project Title: DATABASE MANAGEMENT SYSTEM FOR BYUH JONATHAN NAPELA CENTER

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ABSTRACT

The purpose of this project is to build a database management system (DBMS) for the Jonathan Napela Center department. The Napela Center is a department for students who are majoring or minoring in Hawaiian Studies and/or Pacific Island Studies. Currently the Napela Center uses Microsoft Excel as their DBMS to store and track both current and past student information. Unfortunately, this system hasn't been working well for them due to unreliable information, limited user access and sometime can get too complex with too much data. So the director of the department decided to seek for another system.

This paper will examine the process of building a new DBMS for the Napela Center using XAMPP as the web server, phpMyAdmin as the web application and Drupal 7 as the content management system (CMS). I chose the XAMPP (Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P)) because it seemed to be the "ideal tool for students developing and testing applications in PHP and MySQL" (Dvorski, 2007). I chose phpMyAdmin because Delisle (2009) considered PhpMyAdmin as one of the most prominent free open source application that provides a dynamic graphical interface for executing MySQL. And last but not the least, I chose Drupal 7 because it is the standard CMS that BYU Hawaii uses for their website.

Keywords: database management system (DBMS), XAMPP, phpMyAdmin, content management system (CMS), web-based database (WBDB)

DECLARATION

I hereby certify that this project constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions or writings of another.

I declare that the project describes original work that has not previously been presented for the award of any other degree of any institution.

Signed,

_____

Olivia Moleni

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CHAPTER ONE: INTRODUCTION

Database Management System for BYUH Jonathan Napela Center

Background of the Problem

Jonathan Napela Center for Hawaiian and Pacific Islands Studies is a very small department at the Brigham Young University- Hawaii, with six instructors for Hawaiian Studies and five for Pacific Islands Studies. This department does not have that many students but when it comes to analyzing student information for decision making, they run into some duplication errors and inconsistent values. When the director of the department requests for status and history of current and past student information, it takes weeks for the secretary to get that report done. First, she has to collect data from three different departments: Institutional Research, Alumni and Academic Advising. Second, she has to sort each report and select only what they need for the report. Third, if the information she receives is outdated she has to look elsewhere for the updated information, which happens all the time. Fourth, she has to input and compile all required information into a Microsoft Excel Spreadsheet then run the report requested by the Director.

According to the Director, he has been searching for solutions in other academic departments and have found that they use database to maintain student information. It is then he decided that he needs a database for his department. He could have easily just use what the other departments were using but his needs were different compared to other departments. He started searching for someone to build one for them since they are not familiar with technology. When I heard about his concern through a friend, I decided to approach him and find out if he had found someone to help them. After meeting with the Director and the secretary for the first time, they offered me to work on this database project.

As I conversed with the Director for more information about the project, I learned that the department has an existing website: http://culturesandlanguages.byuh.edu/ which he would like this database linked into it. I also discovered that this website is built on a Drupal content management system (CMS) framework. This gave me the idea that the department will need an online collaborating tool that can take data, sort it and give users ease of access from anywhere with the ability to display data via the web. Therefore, client installation will not be necessary because users will only need a web browser. It will be an easy cross-platform usage with simplified security. Updates will be done live behind the scene and many users can access it at the same time.

Since the university has a strict budget and it is already using Drupal, I decided to follow the same standard and use Drupal as my framework. Drupal requires a familiar understanding of HTML, CSS and PHP. With that being said, I was able to learn the basic of these languages when I enrolled in INFS 736 and 730 and therefore want to put it to practice. Drupal is free, more secure, improved performance and dynamic. There are many ways to create a database in Drupal but in my case I will be creating the database and user using phpMyAdmin which I also learned in INFS 730.

Statement of the problem

The main problem in this process is having to repeat the same thing over and over whenever there is a student status or history report requested from the Director. They do not have any system where it stores all this information and be able to retrieve or update them when the student enrolls, graduate or drop out. Another problem that arises, is when the secretary manually inputs data to the spreadsheet in which sometime runs into duplication; such as student ID number, courses and other errors; such as missing data. This department is in need of a system

that could maintain student information and keep track of current and past students as well as preparing for future students. They will also need training for the new system.

Objectives of the project

The main purpose of this web-based database (WBDB) is to help the Jonathan Napela Center, obtain accurate student status and history information that will allow them to make better decisions for the department's progression. With that being said, the objectives of this project are to:

- Reduce the number of errors in data entry.
- To maintain (enter, update, and delete) data on current and past students information.
- To perform searches on students by major, minor, terms, graduation date, GPA and so forth.
- To track the status of current, graduated and dropout students.
- To report on current, graduated and dropout student status and history.
- And to ensure the data is safe and secure in accordance to the Family Educational Rights and Privacy Act (FERPA) of students.

CHAPTER TWO: LITERATURE REVIEW

Database Management Systems has been around since the 1960s but “the need to store and sort data is much older” (Kopal, 2015). In 1964, Charles W. Bachman designed the very first database management system (DBMS) at General Electric and named it the Integrated Data Store (IDS). “It formed the basis for the network data model, which was standardized by the Conference on Data Systems Languages (CODASYL) and strongly influenced database systems through the 1960s” (Ramakrishnan & Gehrke, 2000). In 1973, Bachman was awarded as the first recipient of ACM’s Turing Award for his achievement in the database field. On February 2015, U.S. President Barack Obama awarded Bachman with the “National Medal of Technology and Innovation for fundamental inventions in database management, transaction processing, and software engineering, for his work designing the first computer database” (Kugler, 2015). Not long after the IDS was launched, IBM developed the second DBMS in the late 1960s and called it the Information Management System (IMS). “IMS formed the basis for an alternative data representation framework called the hierarchical data model” (Ramakrishnan & Gehrke, 2000). A couple of years later, Edgar F. Codd published an article in which he introduced a new data representation framework called the relational data model (Codd 1970). In this model, Codd recommended that all data in a database should be define in tables with columns and rows, which he called relations. This new framework became a rival to IDS and IMS which then became the dominant DBMS in the 1980s. In 1981, Codd won the Turing Award for his seminal work (Ramakrishnan & Gehrke, 2000).

Over the years, more data models were designed such as Object-relational DBMS (ORDBMS), Object-oriented DBMS (OODBMS) and so forth (Danielsen, 1998). Not only the data models spawn so quickly, DBMS expanded as well. According to the DB-Engines Ranking (2017), there are about 330 DBMS that are currently available today. The top 10 are listed in the table below.

Table 1. Top 10 Database Management System

Rank	DBMS	Score	Changes
1.	Oracle	1367.88	-7.00
2.	MySQL	1340.30	-8.81
3.	Microsoft SQL Server	1225.47	-0.52
4.	PostgreSQL	369.76	+ 0.32
5.	MongoDB	330.50	-2.27
6.	DB2	197.47	+ 6.22
7.	Microsoft Access	127.03	+ 0.90
8.	Cassandra	126.72	+ 2.60
9.	Redis	121.90	+ 0.38
10.	Elasticsearch	117.65	+ 1.67
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Note: The data are adapted from DB-Engines Ranking. (2017, July 31). Retrieved August 02, 2017, from https://db-engines.com/en/ranking
Provided by Solid IT.

Out of the top ten database management systems, six of them uses Relational DBMS. These six are Oracle, MySQL, Microsoft SQL Server, PostgreSQL, DB2 and Microsoft Access. DB-Engines also showed two pie-charts with number of systems per database model category and ranking scores in each category (DB-Engines Ranking, 2017). The following figures indicate that the Relational DBMS still dominates in today's database management systems.

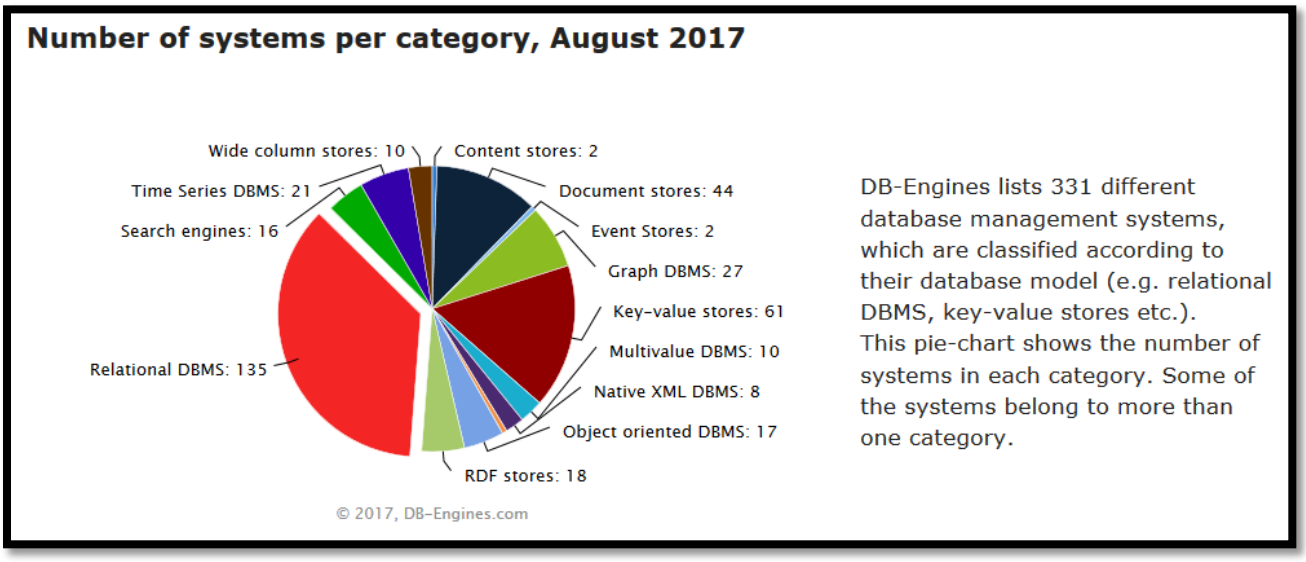


Figure 1. Number of Systems per Category. Adapted from DB-Engines Ranking. (2017, July 31). Retrieved August 02, 2017, from https://db-engines.com/en/ranking
Provided by Solid IT.

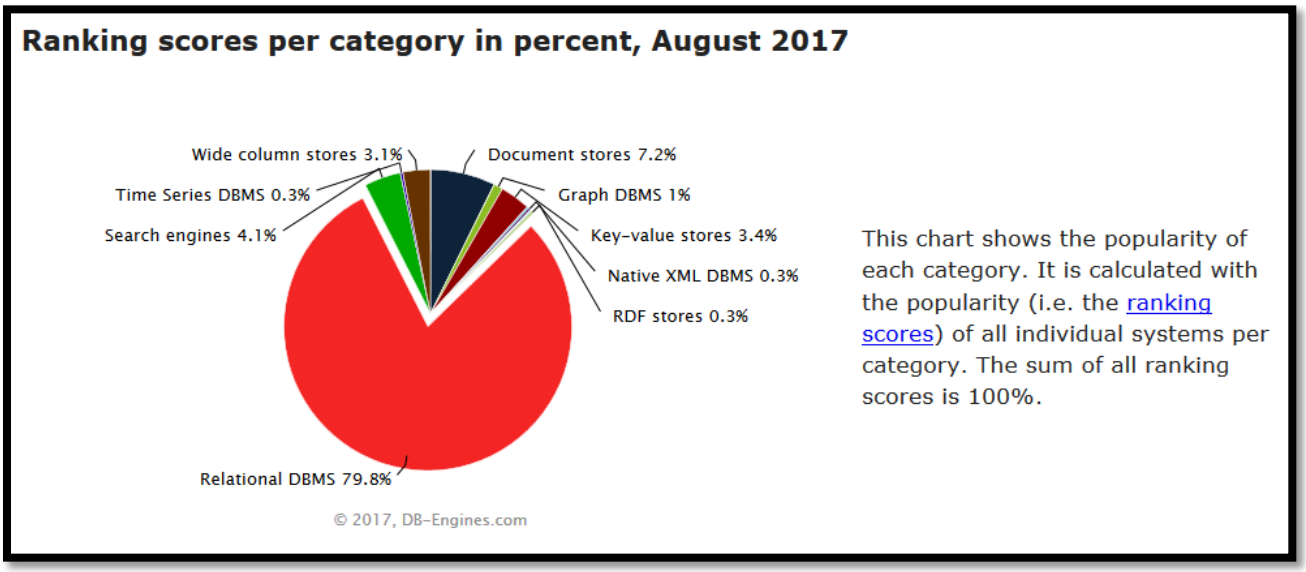


Figure 2. Ranking Scores per Category in percent. Adapted from DB-Engines Ranking. (2017, July 31). Retrieved August 02, 2017, from https://db-engines.com/en/ranking
Provided by Solid IT.

As for this project, I decided to build a web-based database (WBDB), even though Microsoft Access and Excel has been the most common data management system, used by academic departments in Brigham Young University-Hawaii for data storage. They would use Excel to run statistical analyses, summarizing data by using pivot tables or perform simple data visualizations and creating ad-hoc reporting. However, sorting and manually updating data or

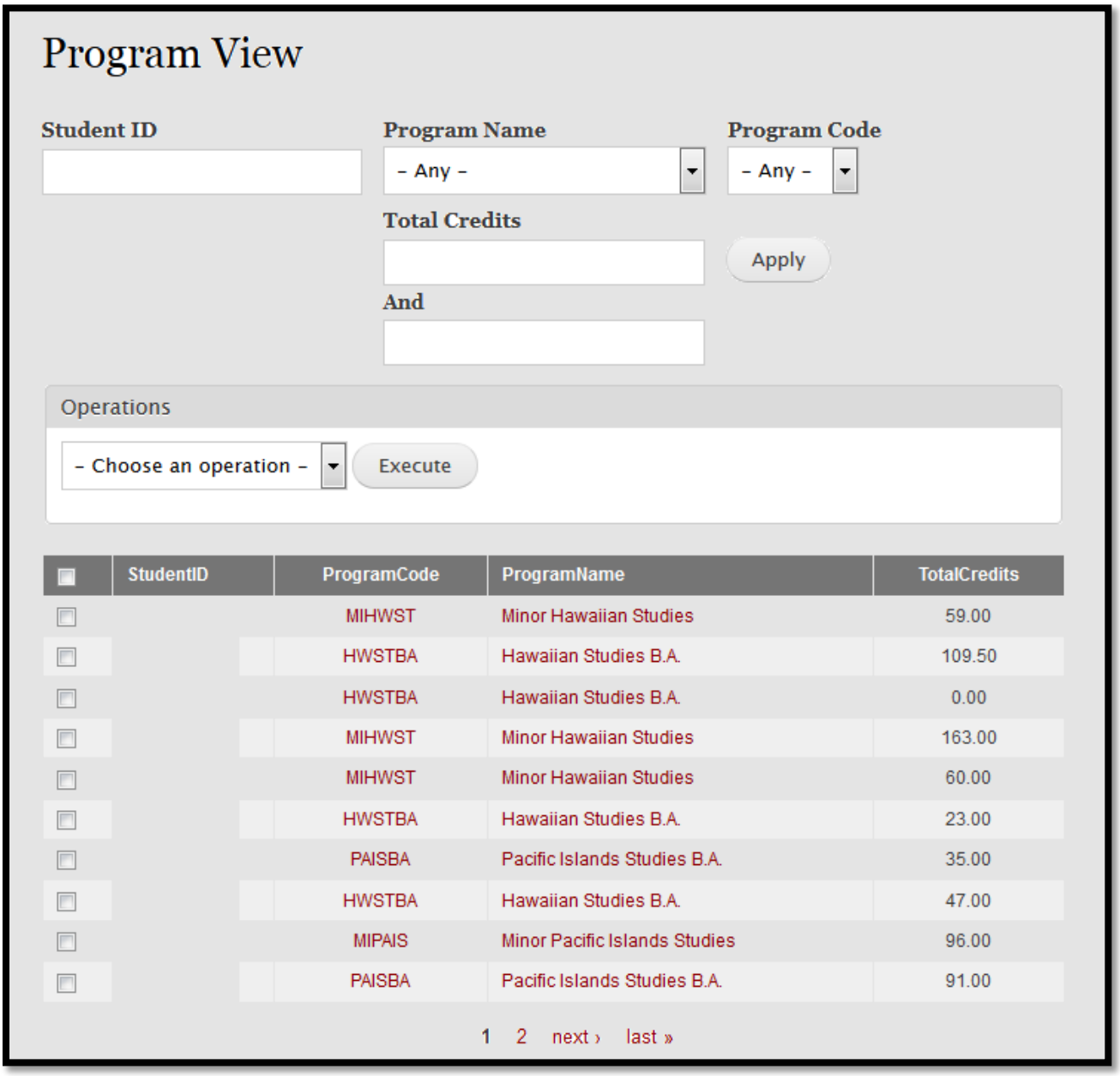
trying to maintain multiple data users will not work for Excel. They would use Access to perform manual data entry, run basic query, combine multiple data sets and use recurrent data reporting. But it doesn't do well with summarizing or analyzing existing data sets. "While each tool has its own strengths and limitations, one isn't necessarily better than the other. Choosing the right tool is a matter of understanding your needs." (Staff, 2016)

I chose web-based database (WBDB) because of its reputation in database applications. I learned that WBDB is recognized for the following reasons:

- "Ease of use: point and click simplicity
- Accessibility: securely accessible from anywhere
- Lower total cost of ownership: to secure, scale, deploy and maintain" (LightSpoke, 2003).

Although "most databases in use nowadays are relational databases, client/server databases are the basis for WBDBs" (Moghaddam, 2009). I like that WBDB allows easy cross-platform usage on any operating system with simplified security. I admire its functions to do advance search and allow users to be specific. The following table shows this type of search interface:

Table 2. Advance Search from the Napela Center DBMS



And last but not the least, I value how updates are done live behind the scene and many users can access it at the same time.

CHAPTER THREE: SYSTEM DESIGN

Research Methodology

There are many ways to collect information and data for the intent of making better decision and setting up future goals. Some may use interviews, surveys, publication research and many more. For this specific database management project, all data were received in an excel spreadsheet given to me from Institutional Research, Alumni and Academic Advising departments. These departments use online DBMS which allows them to run reports and export them to CSV files.

Requirements Analysis

As mentioned before, I met with the department director and the secretary to discuss the problem that they were having with the current system. Based on the director's description, they were using Microsoft Excel to run the reports that they needed for analyzing student information. The problem they were facing with this system, is data duplication, incomplete data information and taking at least two to three weeks to get the report done. The director also mentioned that other academic departments were using Microsoft Access to manage their student information. He asked if I could build one for them. I suggested to them using a web-based database (WBDB) system instead. I explained the benefits that the WBDB offers such as easy to use, securely accessible from anywhere, does advance search, cost less and so forth. The director was interested so was the rest of the team for the new system to be a web-based database system. Therefore, the plan began and the system was designed and implemented.

Designing the WBDB

The Napela Center database system is designed to have four tables. The first table is called "Program" for the list of programs available in the Napela Center. The second table is called "Student" which has personal information about the student. The third table is called "Enrollment"

for tracking students that are enrolled in the department programs each semester. And last but not the least a table called “Course” for all students that are registered in the courses offered by the department.

Database Definition

Below is the list of fields that are associated with each table follow by the design of the database. Each table has their own primary key (PK) and foreign key (FK).

Program Table consist of the following fields: StudentID (PK), ProgramCode (PK), ProgramName, TotalCredits, ProgramNote.

Student Table consist of the following fields: StudentID (PK), ProgramCode (FK), LastName, FirstName,Gender, DOB, Email, Status, City, State, GraduationSem, Career and StudentNote.

Enrollment Table consist of the following fields: StudentID (FK), ProgramCode (FK), CourseCode (PK), Semester (PK), EnrollmentLevel, SemCredits and EnrollmentNote.

Course Table consist of the following fields: CourseCode (PK), StudentID (FK), ProgramCode (FK), Semester (FK), CourseName, CourseCredits and CourseGrade.

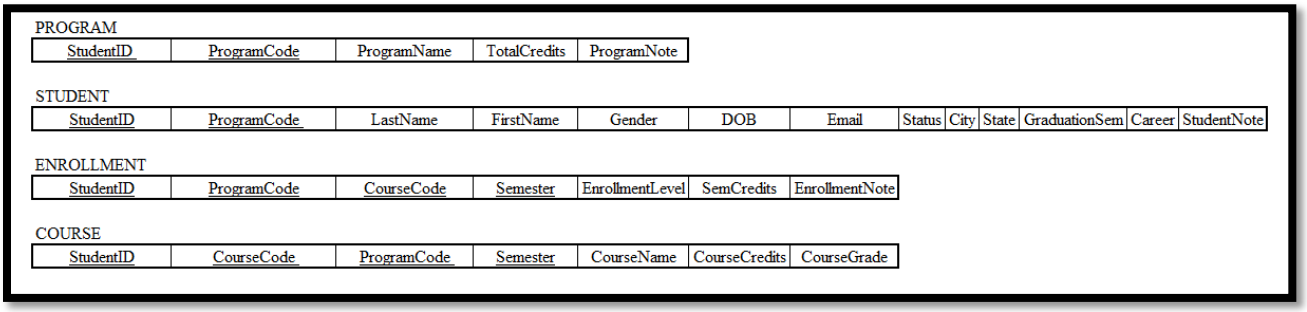


Figure 3. Schema diagram for the Napela Center Database.

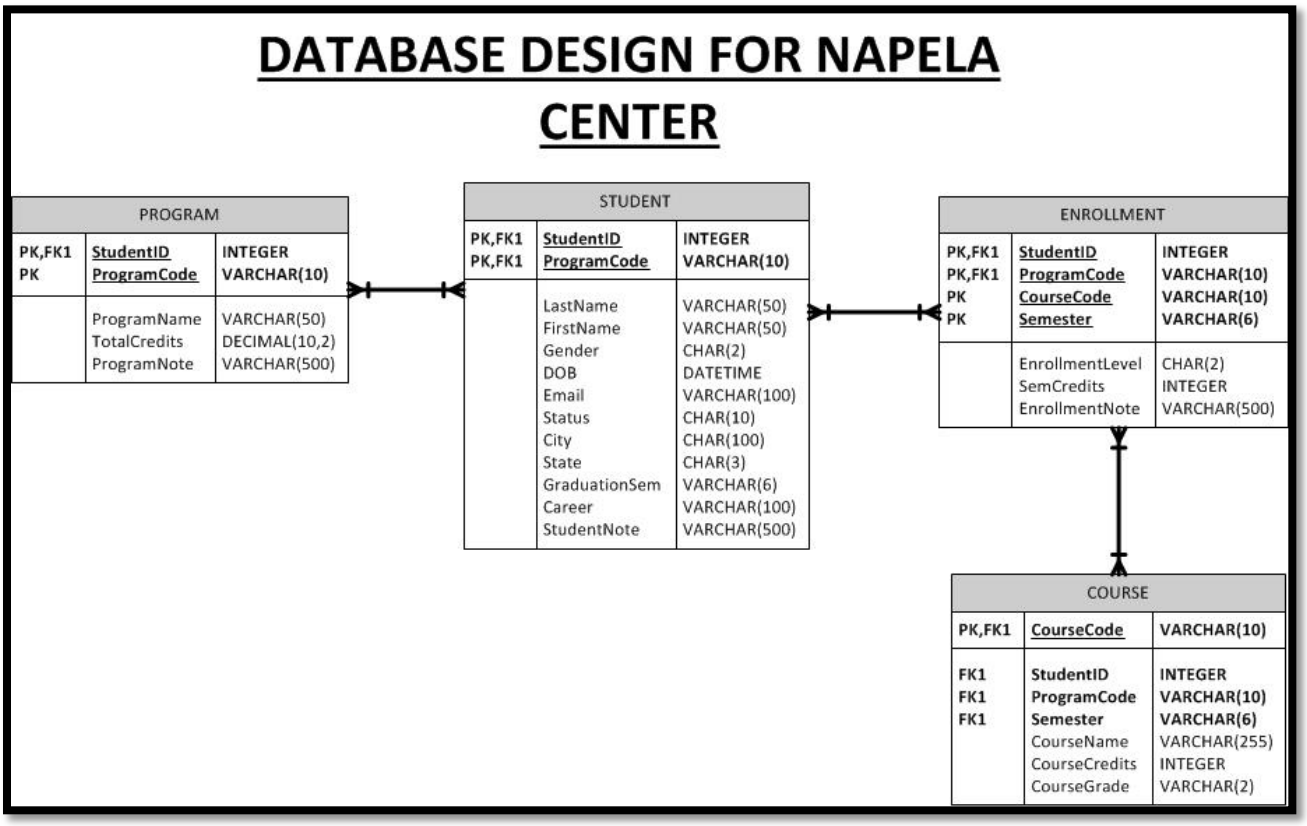


Figure 4. Database Design for the Napela Center

Database Processing Flow Chart

The process of this database is as follow:

1. The worker collects excel spreadsheet with student data information in it.
2. The worker will input those information into the database.
3. When the director needs a report, he will inform the worker what requirements he needs in the report.
4. The worker will select those fields using the advance search and run a query.
5. Once the report is generated, the worker can export that data to either a .csv, .xls or .doc depending on director's request.

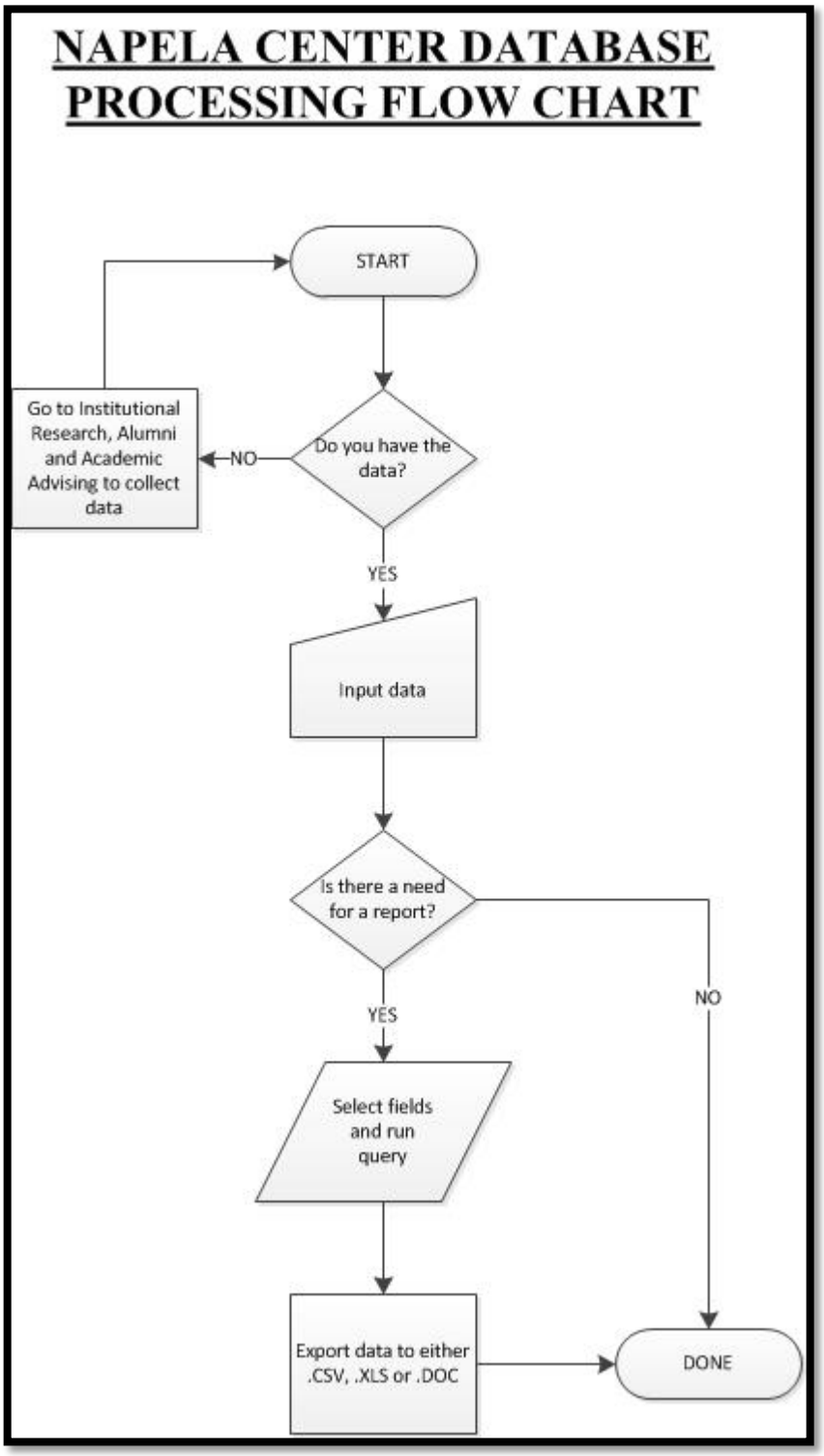


Figure 5. Database Processing Flow Chart

Building of the DBMS

I plan to build this web-based database (WBDB) in a way that is user friendly and easy to maintain. This database will allow the administrator to store, retrieve, update, and delete student

information when necessary. Overall, this simple information management application will allow the department to manage related data more efficiently and in return use it for referencing, reporting, and analysis. With that being said, I will need to have a web server, web application and a content management system in order to complete this project.

Selecting the Web Server

According to Schroeder, Goddard & Ramamurthy (2000), "The exponential growth of the Internet, coupled with the increasing popularity of dynamically generated content on the World Wide Web, has created the need for more and faster Web servers…." In an article written by Robin Muilwijk (2016), he thinks that the Apache HTTP Server is by far the most popular web server. With that being in mind, I chose to use XAMPP which stands for Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P). "XAMPP is a small and light Apache distribution containing the most common web development technologies in a single package. Its contents, small size, and portability make it the ideal tool for students developing and testing applications in PHP and MySQL" (Dvorski, 2007). Not only it is an ideal tool for developing and testing applications, there were other people who would use it for their web-based projects. Walia & Gill (2004) used the XAMPP for building their Student Record Management System (SRMS). De Miguel-Bilbao, Aguirre, Lopez Iturri, Azpilicueta, Roldan, Falcone & Ramos, (2015) used the XAMPP for evaluating electromagnetic interference and exposure assessment based on WiFi devices. And last but not the least, Kassim, Mazlan, Zaini & Salleh (2012) used the XAMPP to build a web-based student attendance system.

Selecting the Web Application

In the field of computing, a web application is considered as a client-server software application in which the client runs in a web browser. According to Elbaum, Karre and Rothermel, "web applications have become critical components of the global information infrastructure, and it is

important that they be validated to ensure their reliability" (Elbaum et al., 2003). Selecting one is not an easy task, but I will try my best to choose one that is reliable. There are a few web application written for the management of website databases. Such application include: Web browser-based control panel (such as "CPanel" or "Plesk"), phpMyAdmin, creating the database directly and so forth. With this project, I chose to use phpMyAdmin for the following reasons. Delisle (2009) considered PhpMyAdmin as one of the most prominent free open source application that provides a dynamic graphical interface for executing MySQL. "Bringing a web interface to MySQL has made phpMyAdmin an indispensable tool for MySQL and web developers" (Delisle, 2009). Rosie (2014) defined PhpMyAdmin as a user-friendly interface that performs most of the MySQL functions and has the capability to alter, import and export data.

Selecting the Content Management System (CMS)

Nurminen, Wikman, Kokkinen, Muilu and Gronhdm (2008) states the function of a content management system is to protect the code of a web site and allow the developers to develop and maintain the site with high level graphical user interface. As for this project, I decided to use Drupal 7. There are many reasons for this but here are a few of them. Drupal 7 is the standard platform that Brigham Young University-Hawaii uses for all department websites that are linked on the campus web page. Drupal also enable users to update their web pages without technical knowledge and ensure that it fits their organization's workflow (Patel, Rathod and Prajapati, 2011). Drupal is a dynamic platform and it will grow as your need expands. In an article wrote by Glen Stansberry (2009), Drupal is known for their many modules that can add lots of interesting features like forums, user blogs, profiles and so forth. One of Drupal's most popular feature is the Taxonomy module which allows for multiple levels and types of categories for content types (Stansberry 2009). And last but not the least, I like Drupal because of its many plugins.

SYSTEM REQUIREMENTS:

Hardware Recommendations

- 3 GHz Processor
- 2 GB RAM
- DISK SPACE: 60 MB is needed for a website with many contributed modules and themes installed. However, a minimum of 80GB or more for the database, base installation, files uploaded by the users, backups and other files.
- 1024 x 768 Resolution Monitor
- Minimum 56 Kbps connection speed Web Server Requirements
- Apache, Nginx, Microsoft IIS or any other web server with proper PHP support.

Database Requirements

- Drupal 7:
    - MySQL 5.0.15/MariaDB 5.1.44/Percona Server 5.1.70 or higher with PDO,
    - PostgreSQL 8.3 or higher with PDO,
    - SQLite 3.3.7 or higher
    - PHP 5.2.5 or higher (5.4 or higher recommended). Browser Requirements
- Internet Explorer 6.x and later
- Firefox 5.x and later
- Opera 12 and later
- Safari 5.x and later
- Google Chrome

Known Issues: IE8 and older has a problem with loading more than 31 style sheets, a situation that may be encountered if you are using a contributed theme or number of contributed modules. An acceptable workaround is to enable CSS aggregation (Drupal Association, 2001).

CHAPTER FOUR: CASE STUDY

Implementation

This involves the process of building the web server - XAMPP, application server - phpMyAdmin and the content management system – Drupal 7. As mentioned before, Drupal 7 has so many module that you can download from drupal.org and use it for building the website. The hard part of this is finding the right module that will fit your needs. For this project I have downloaded so many and did testing to see which will meet the objective of this project. In the end, I found the following modules to be more qualified for this project. I downloaded backup_migrate, chart, ckeditor, ctools, entity, nodeaccess, token_custom, unique_field, views, views_bulk_operations, views_data_export, views_distinct and so forth. Each module plays an important role on the website which will be explained later.

I will also include creating the website contents, views and populating it with data for testing. Creating the contents can be as simple as you want or complicated if you are familiar with Drupal 7. In my case, I will keep it simple. There are two types of content, “Basic Page” and “Article”. For this project I will use the “Basic Page”. It is important that you create the contents before the views. Once you create all the contents you need, then you will have to start filling out your contents with data before you can create your views. “Views” is a powerful module that allows administrators and site designers to create, manage and display lists of content. For example, the two tables below presents the “Course Content” and the “Course View”.

Table 3. Course Content

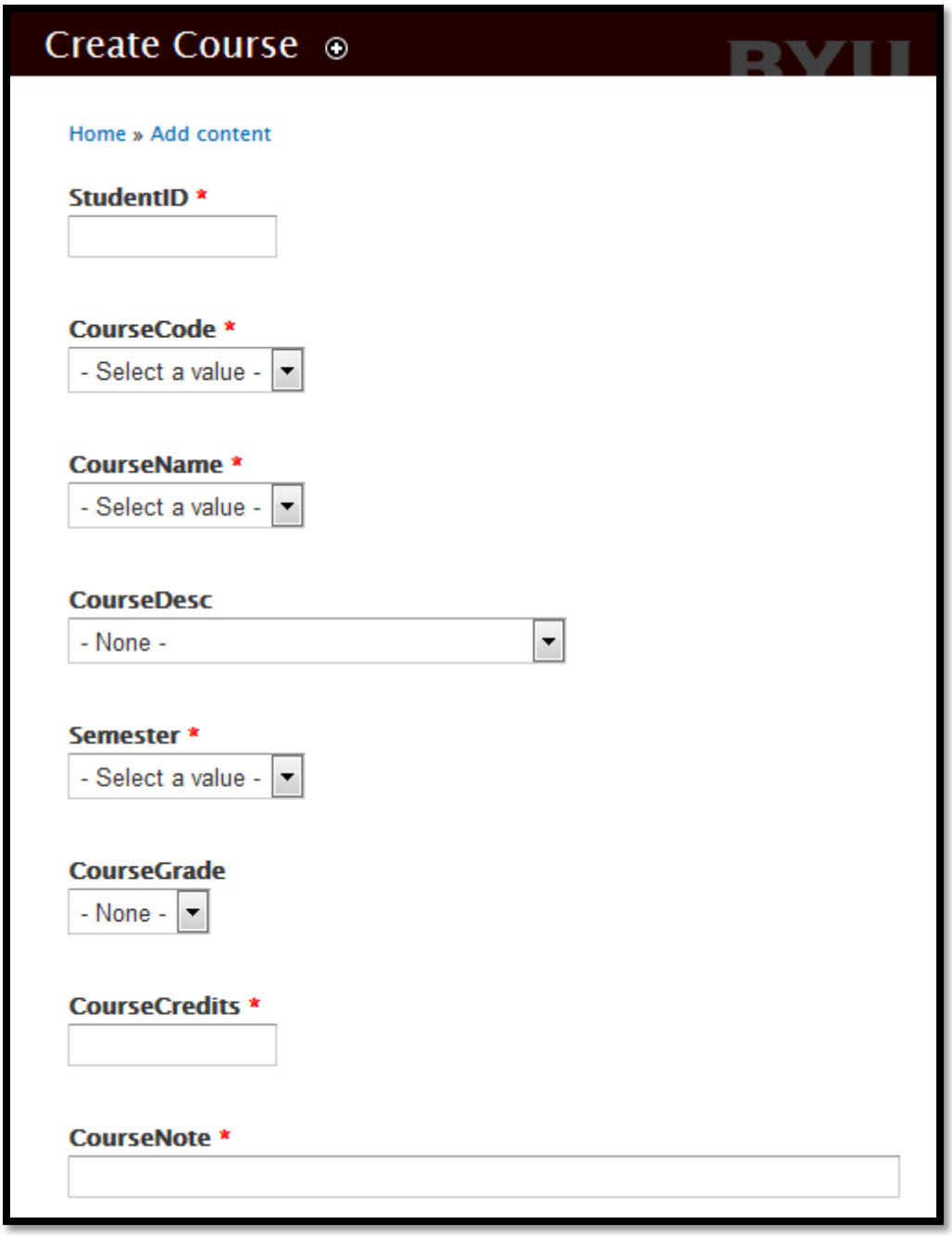
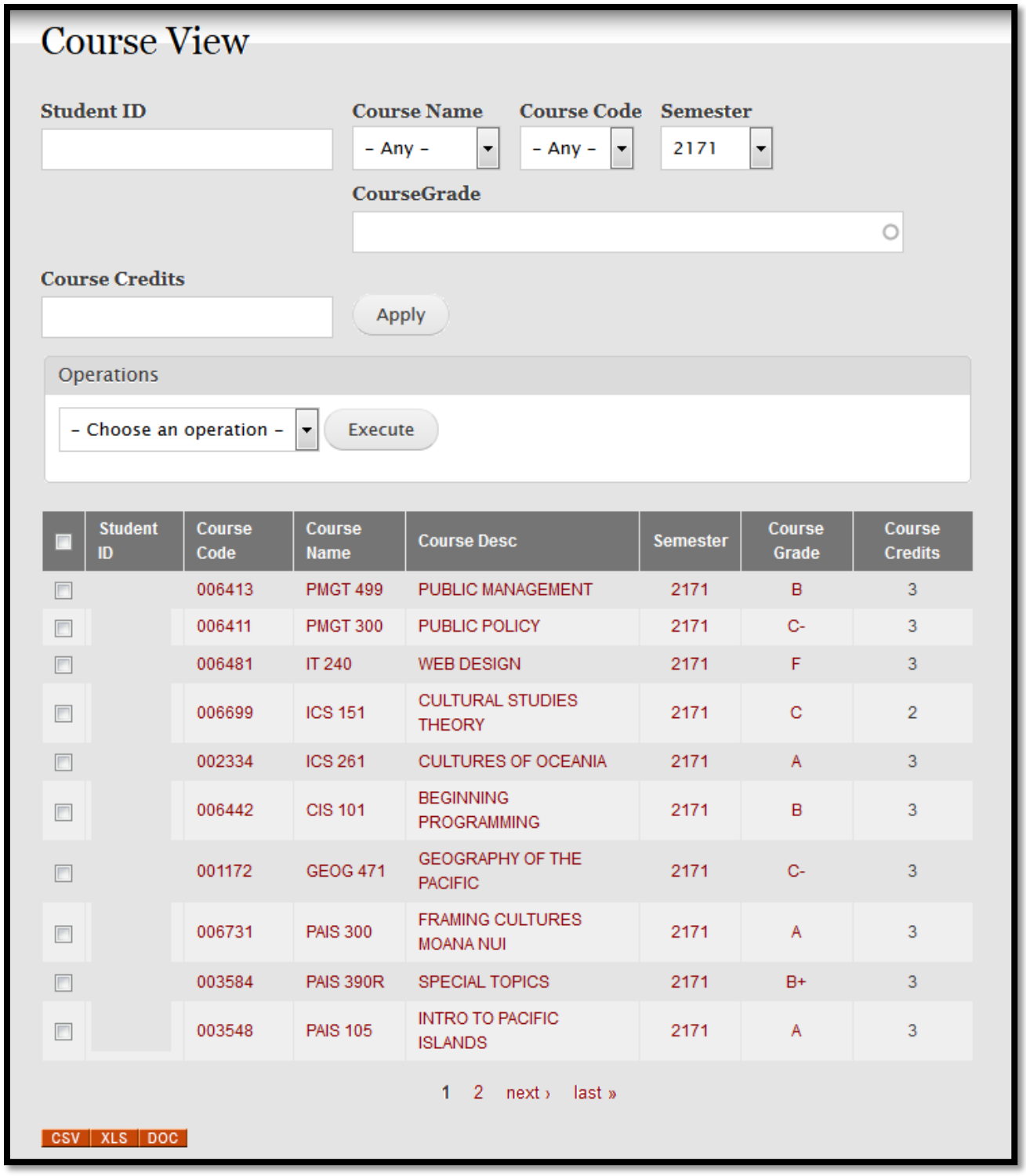


Table 4. Course View sort by the semester 2171.



Course View

Student ID | Course Name: – Any – | Course Code: – Any – | Semester: 2171

CourseGrade

Course Credits

Apply

Operations

– Choose an operation – | Execute

Student ID	Course Code	Course Name	Course Desc	Semester	Course Grade	Course Credits
	006413	PMGT 499	PUBLIC MANAGEMENT	2171	B	3
	006411	PMGT 300	PUBLIC POLICY	2171	C-	3
	006481	IT 240	WEB DESIGN	2171	F	3
	006699	ICS 151	CULTURAL STUDIES THEORY	2171	C	2
	002334	ICS 261	CULTURES OF OCEANIA	2171	A	3
	006442	CIS 101	BEGINNING PROGRAMMING	2171	B	3
	001172	GEOG 471	GEOGRAPHY OF THE PACIFIC	2171	C-	3
	006731	PAIS 300	FRAMING CULTURES MOANA NUI	2171	A	3
	003584	PAIS 390R	SPECIAL TOPICS	2171	B+	3
	003548	PAIS 105	INTRO TO PACIFIC ISLANDS	2171	A	3

1 2 next › last »

CSV XLS DOC

Installing the XAMPP Web Server

STEP 1: INSTALL THE XAMPP

Figure 6. Access the Apache website: https://www.apachefriends.org. To download the installer.

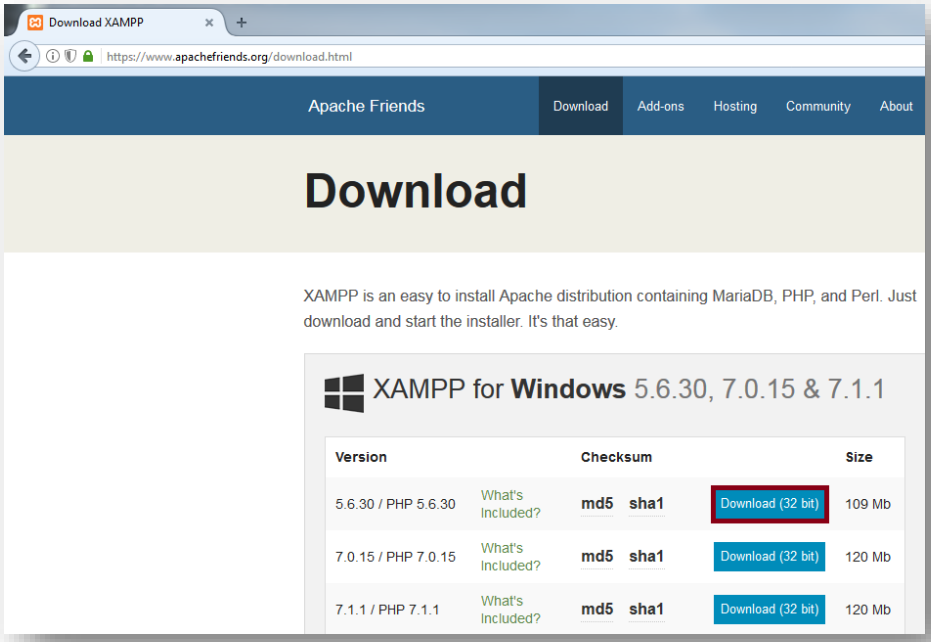


Figure 7. Download link for XAMPP.

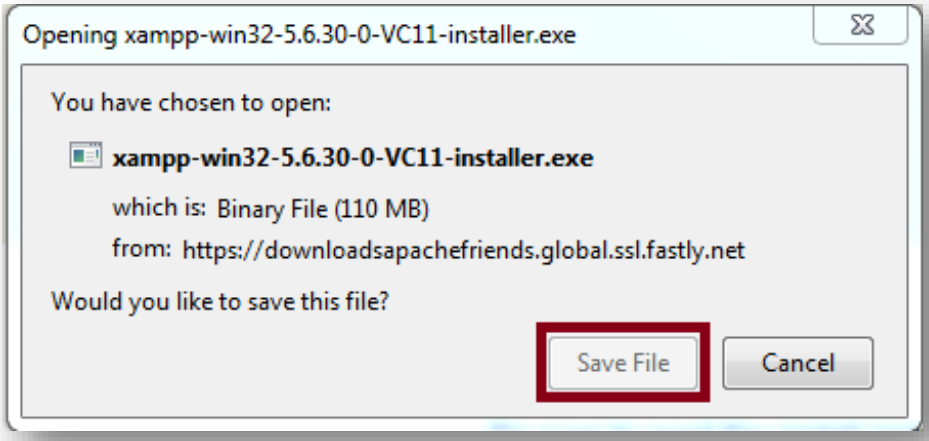


Figure 8. Opening the XAMPP installer file. Save the file and run it.

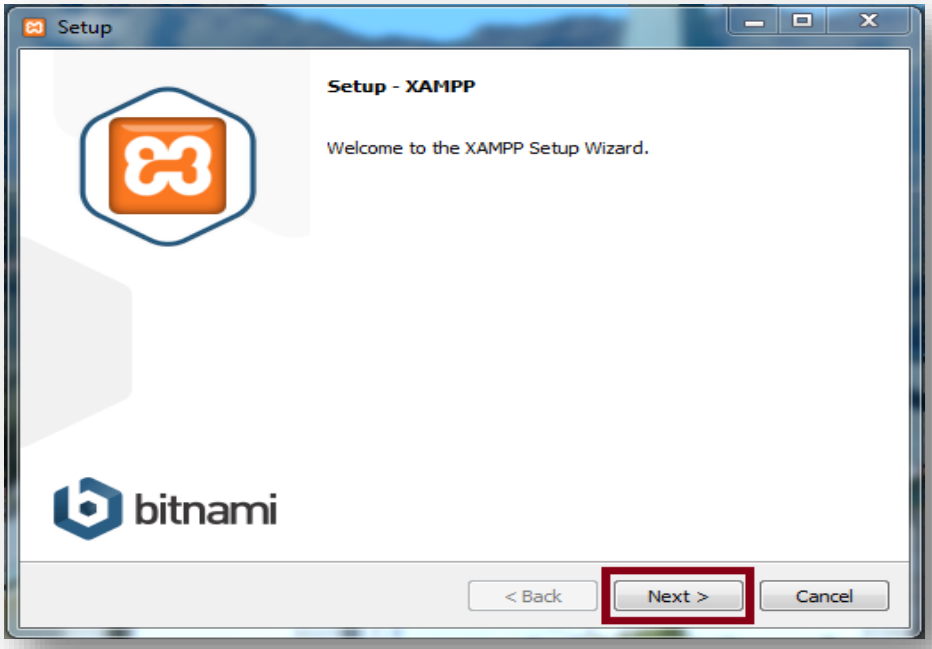


Figure 9. Setup XAMPP - Accept all default settings.

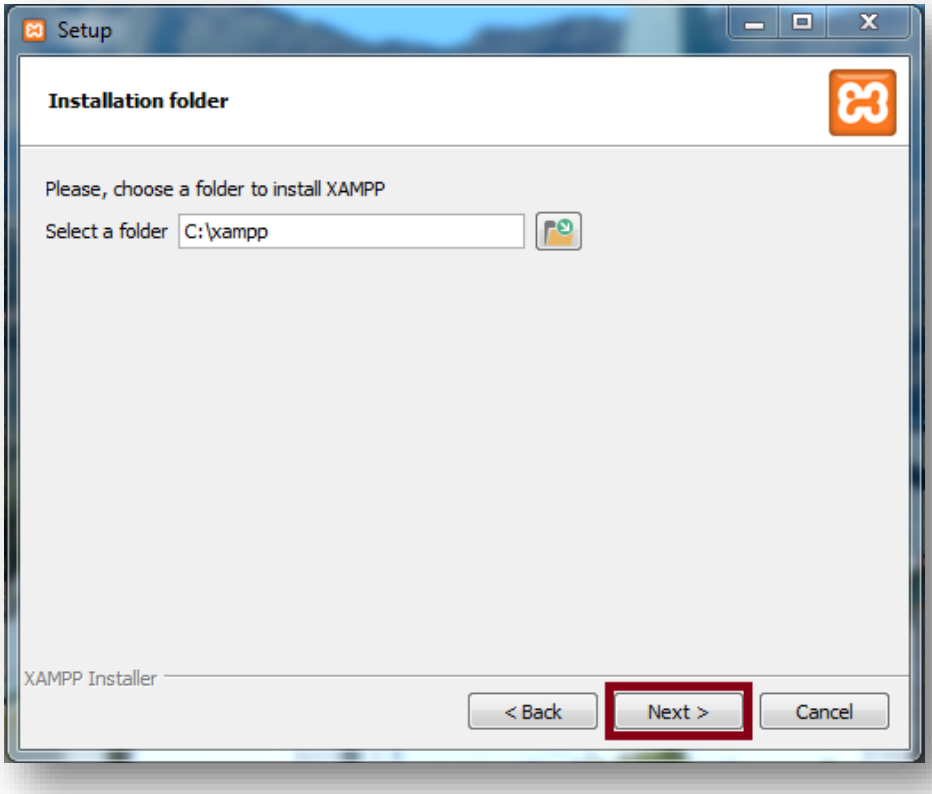


Figure 10. Setup the XAMPP installation folder. Click Next.

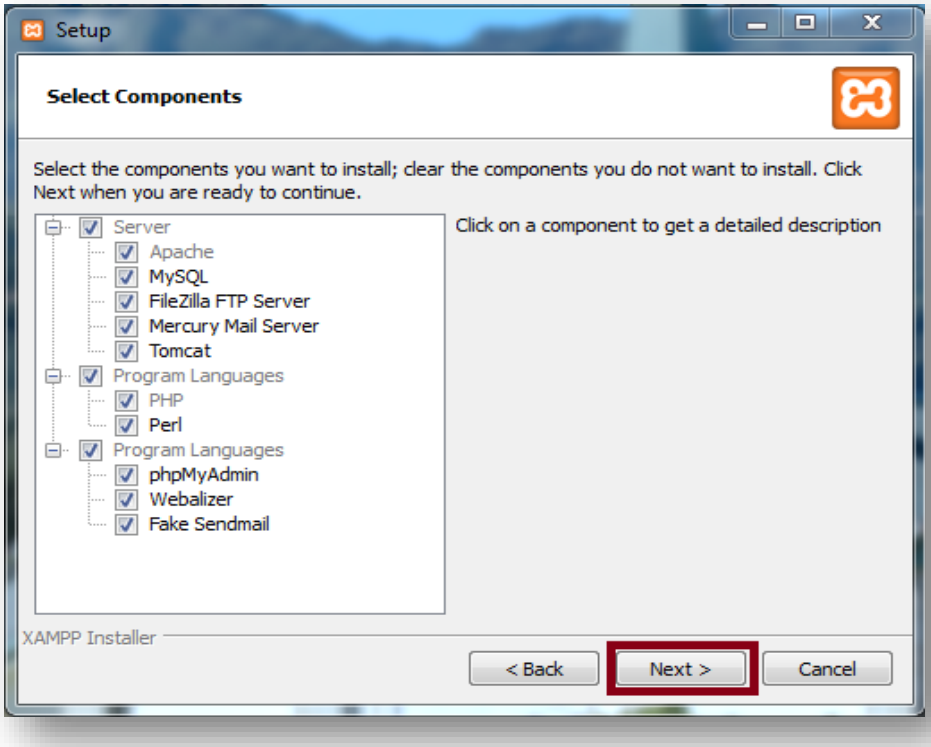


Figure 11. Select XAMPP Components. Click Next

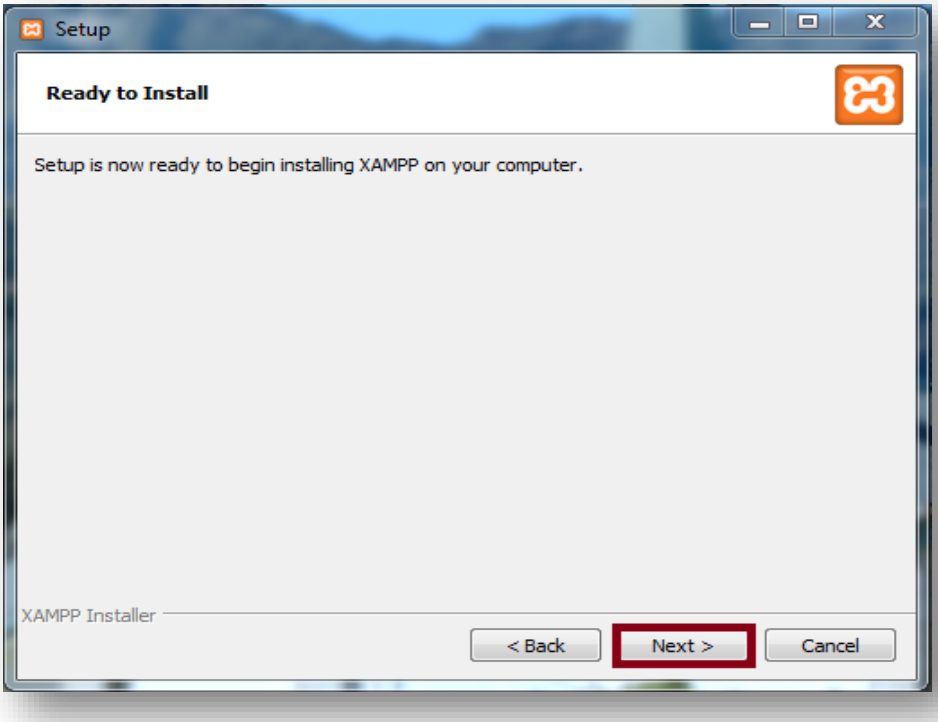


Figure 12. XAMPP ready to install. Click Next

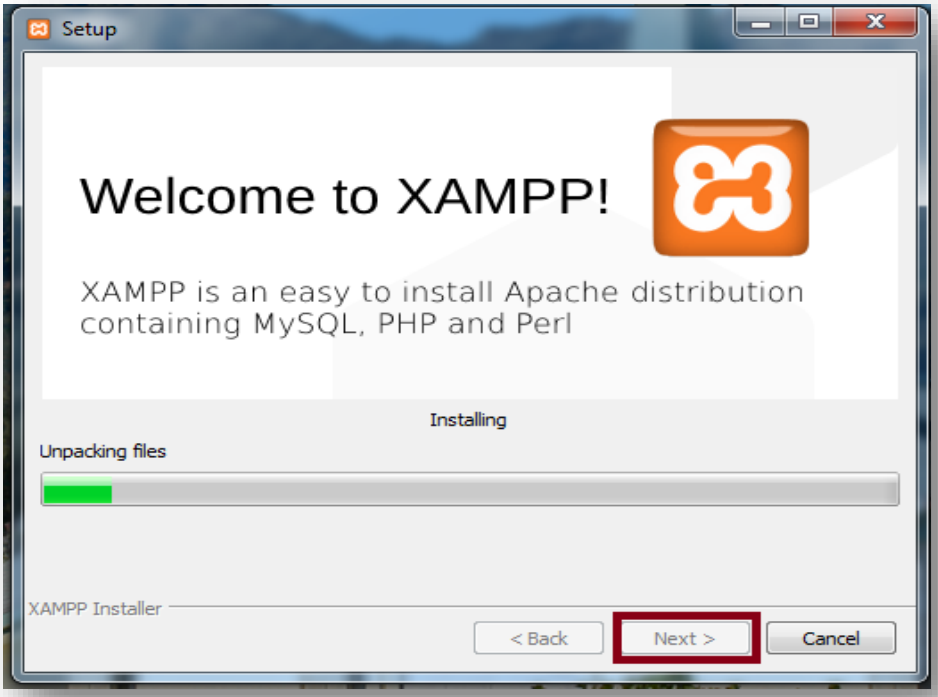


Figure 13. XAMPP installation in progress. Click Next.

Figure 14. Unpackaging XAMPP files. Click Next

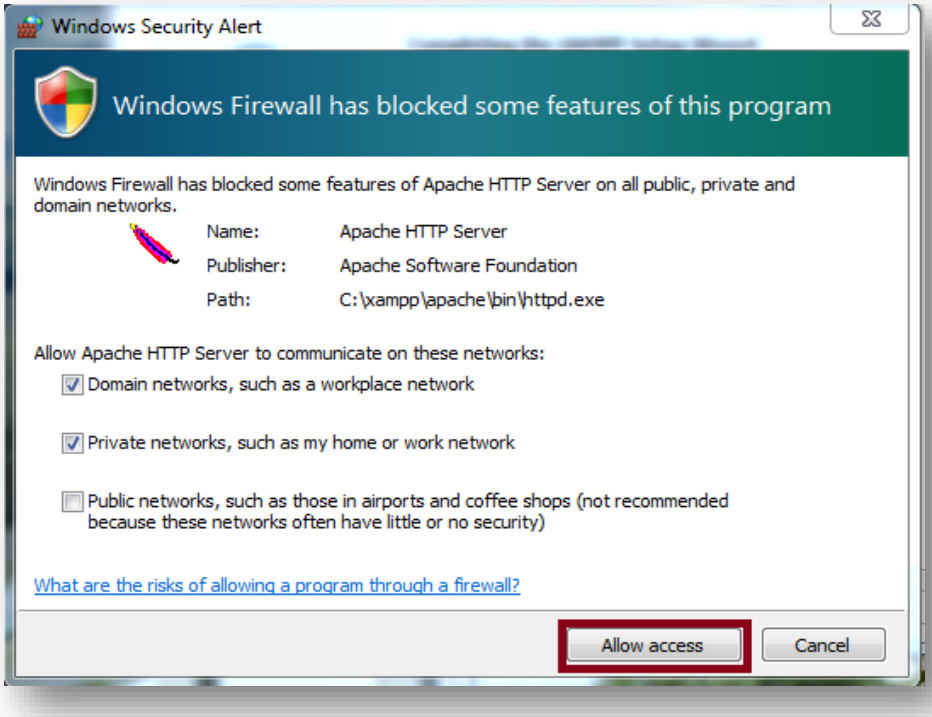


Figure 15. Setup XAMPP Windows Security firewall. Allow Access

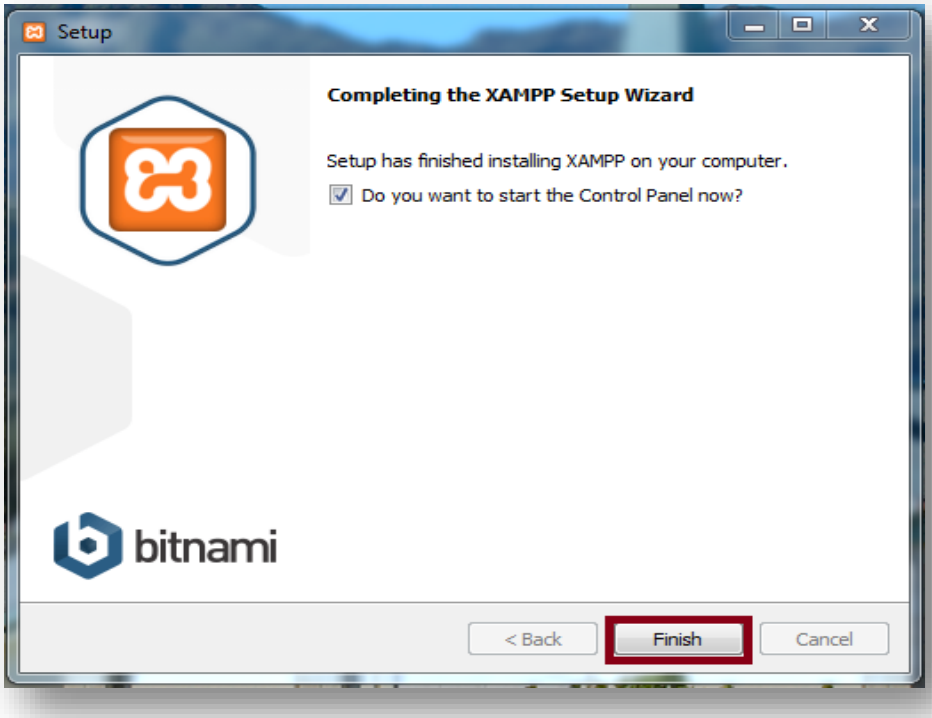


Figure 16. XAMPP installation completed. Click Finish

Continue to Configure phpMyAdmin and Drupal 7

Figure 17: Select the XAMPP Language.

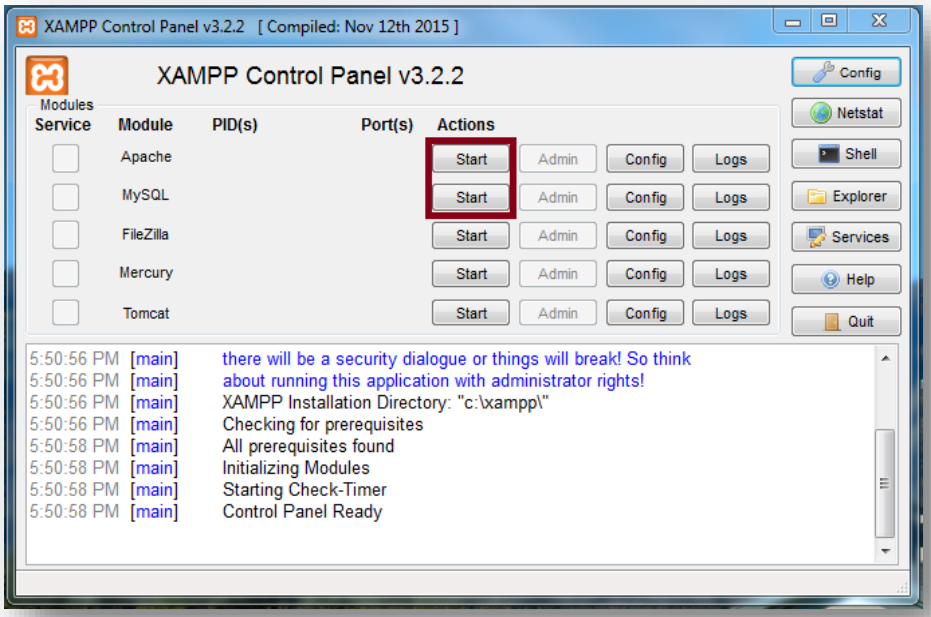


Figure 18: Start the Apache and MySQL on XAMPP

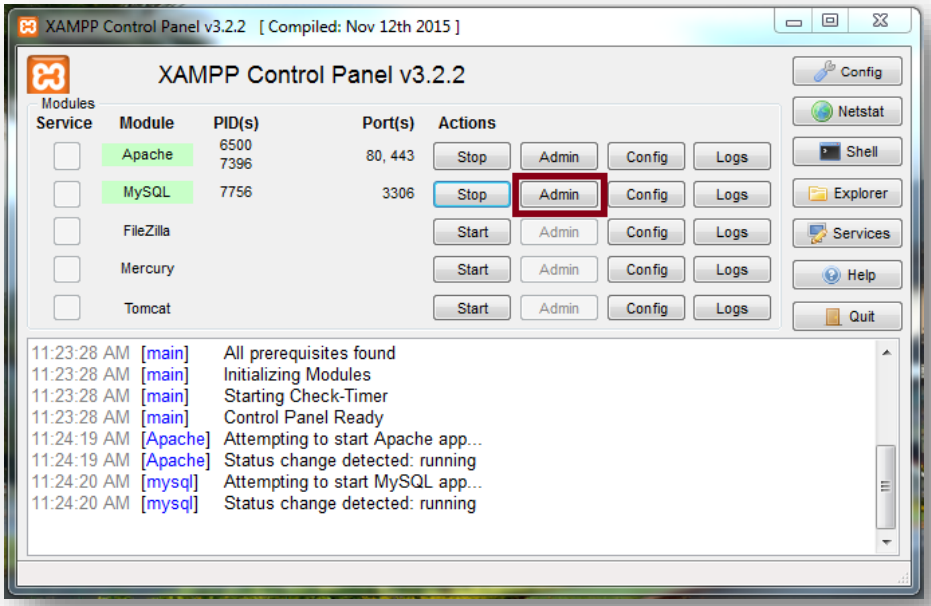


Figure 19: Test Apache and MySQL in XAMPP by pressing the “Admin” button.

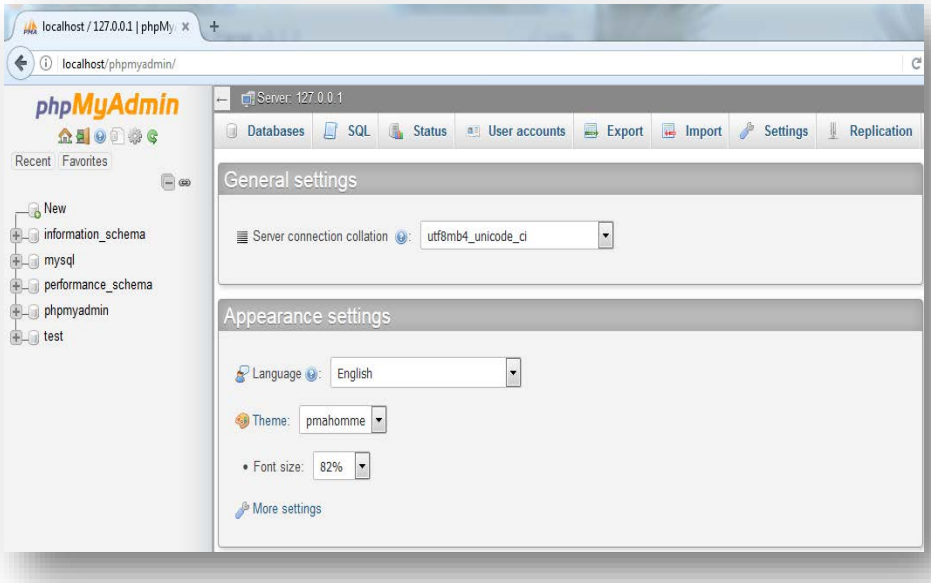


Figure 20: phpMyAdmin Confirmation.

Figure 21: Open a web browser and enter “localhost” on your address bar. If you are redirected to a page like the picture above then the installation was completed.

STEP 2: DOWNLOAD AND EXTRACT DRUPAL

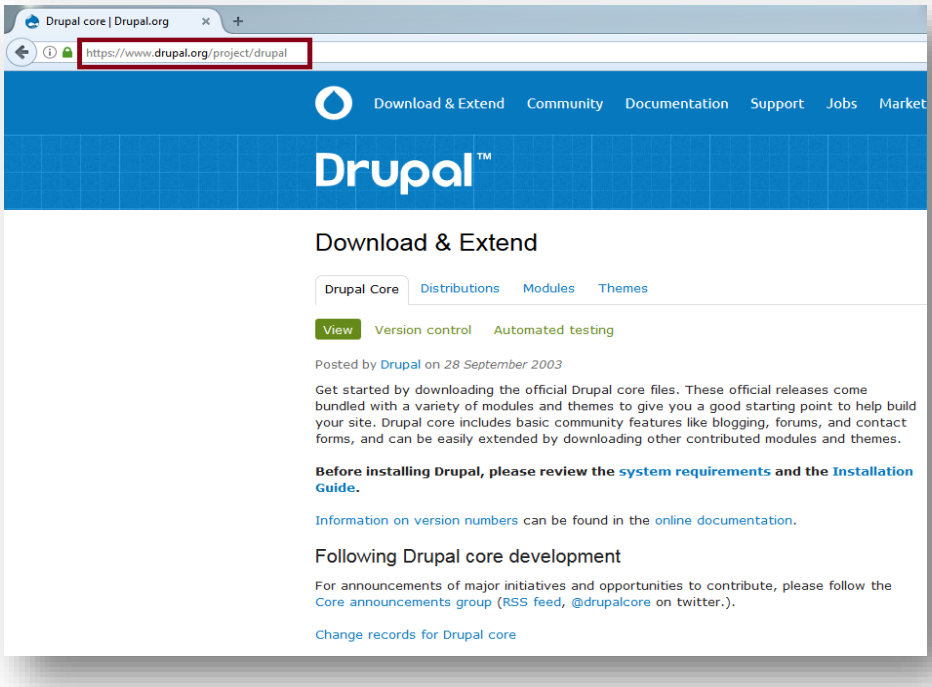


Figure 22: Next download and extract Drupal from their website. Go to the website: https://www.drupal.org/project/drupal.

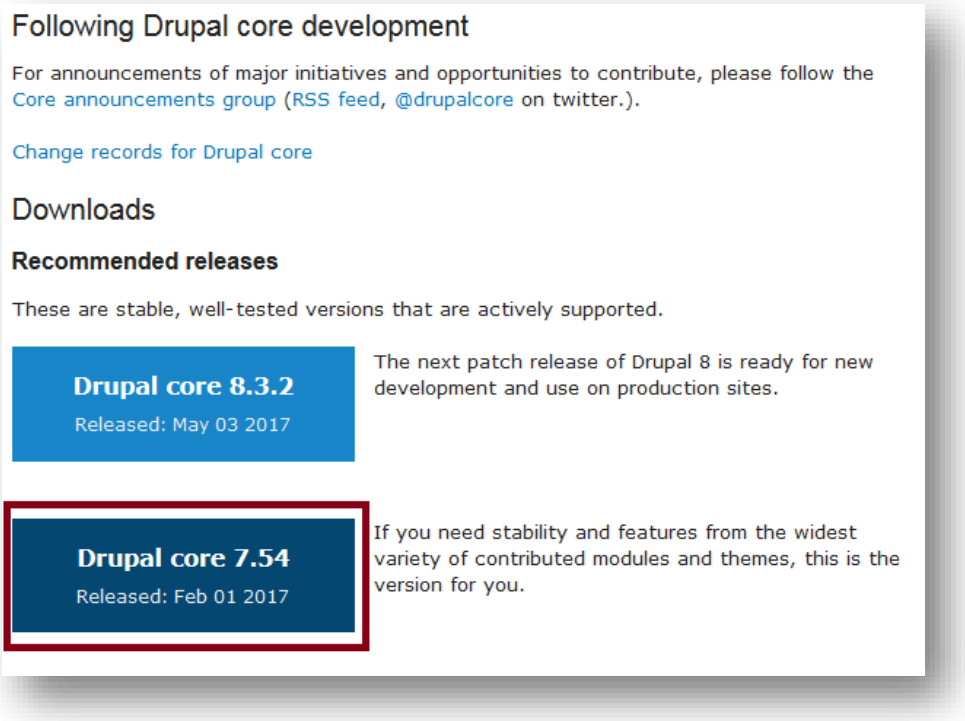


Figure 23: Download “Drupal Core 7.54”

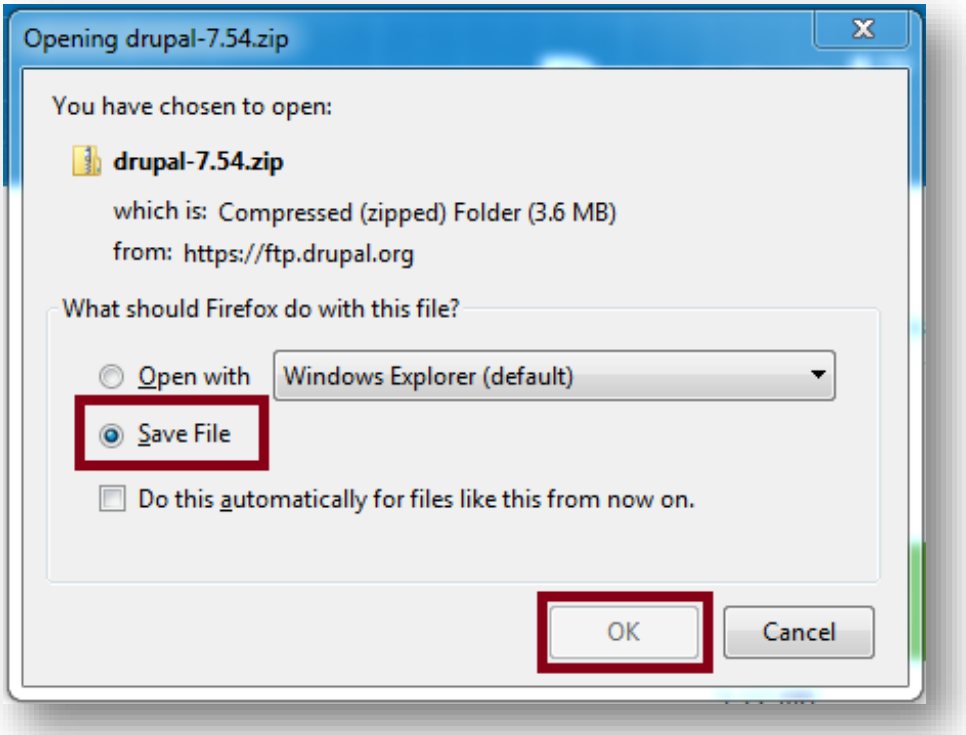


Figure 24: Save the Drupal 7 zip file and extract it after.

STEP 3: CREATE THE DATABASE

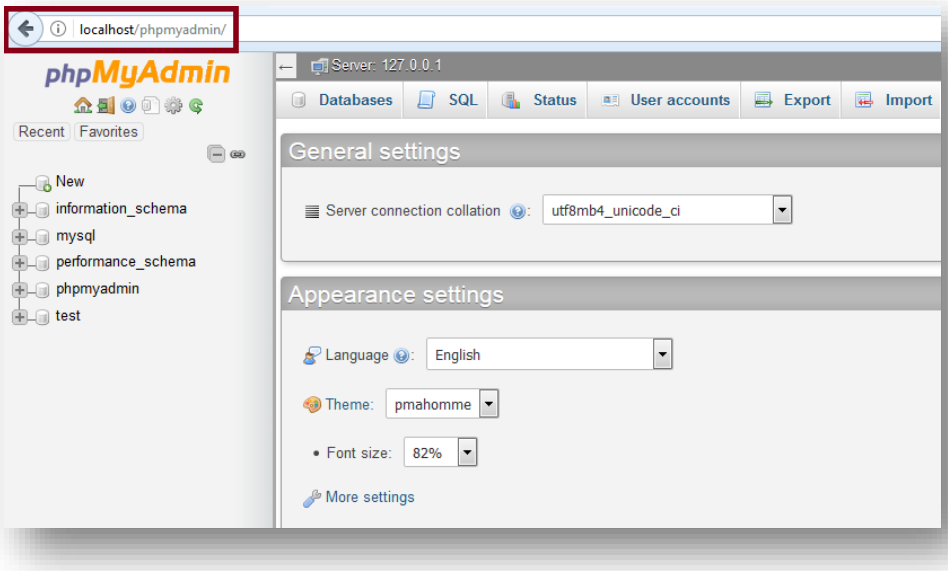


Figure 25: Sign in to phpMyAdmin as the root user.

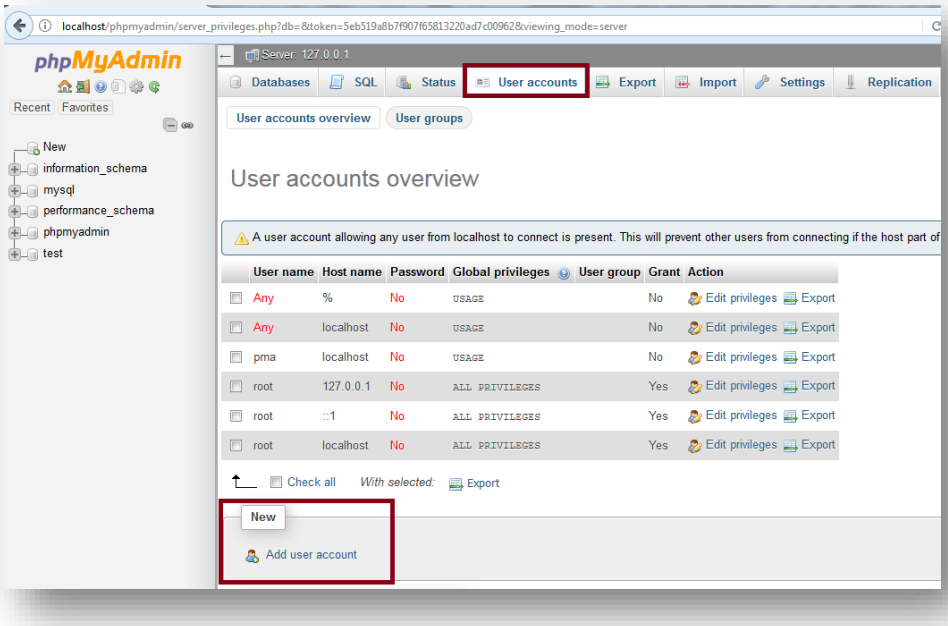


Figure 26: Select “User Account”, and then “Add user”.

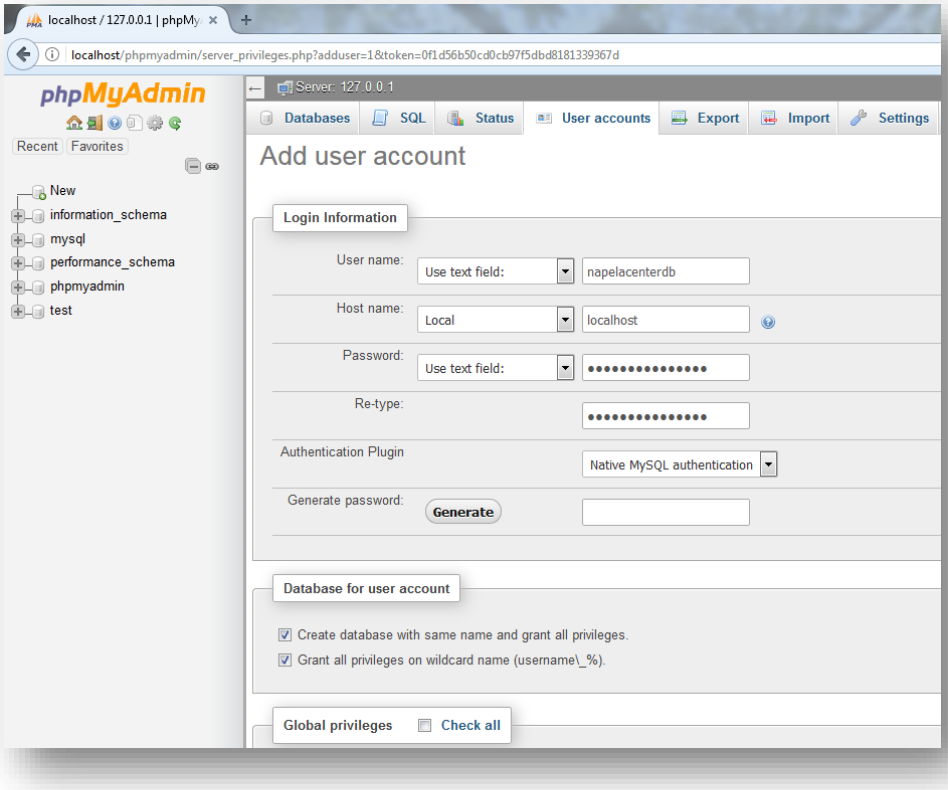


Figure 27: Fill out the login information

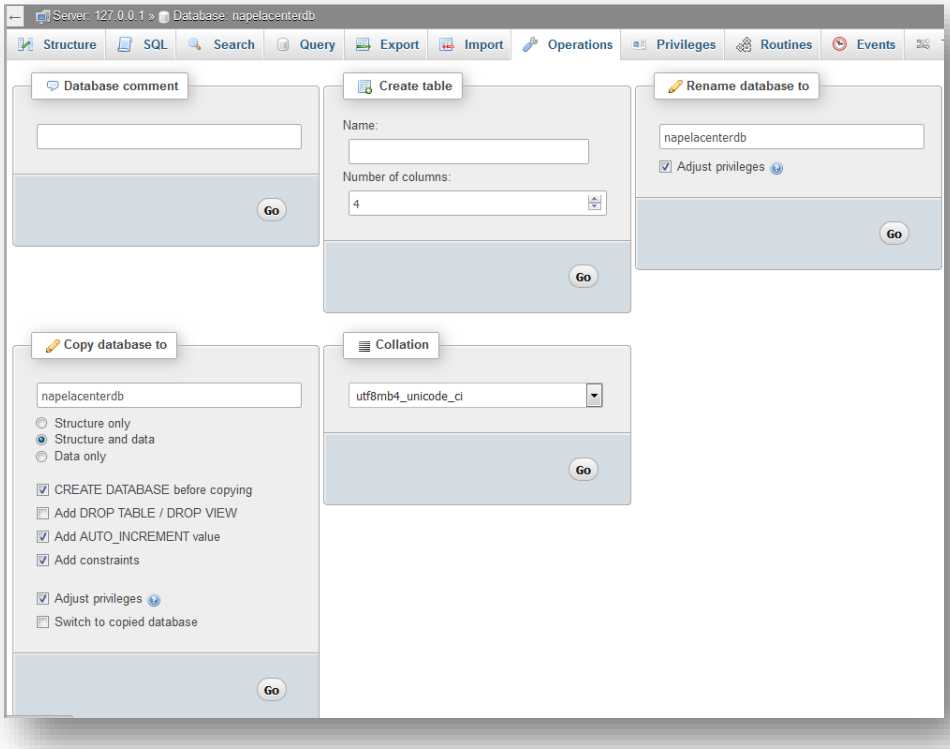


Figure 28: Select COLLATION utf8_unicode_ci then clicked GO.

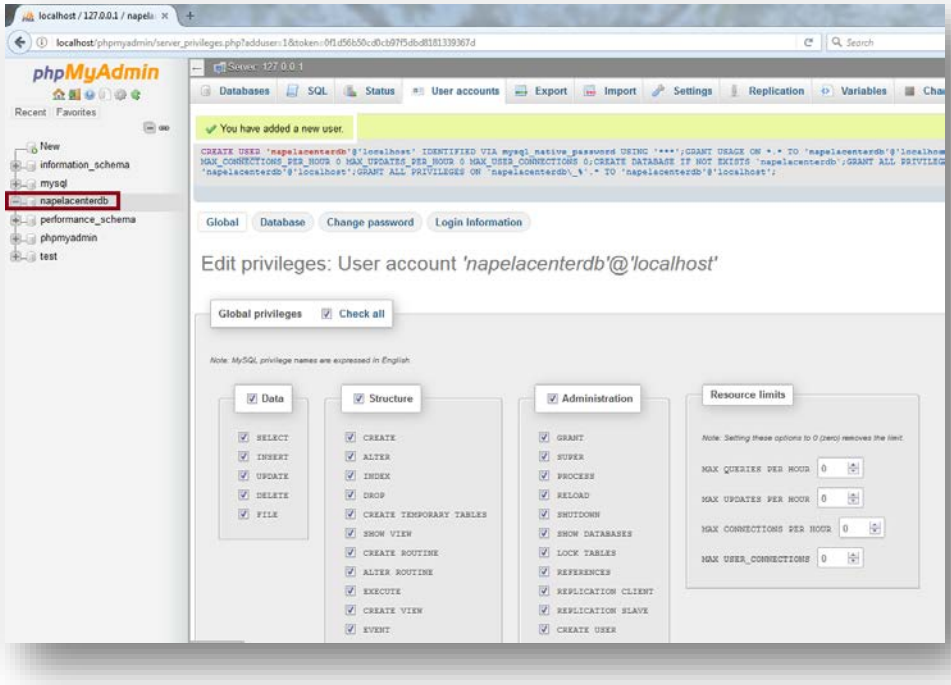


Figure 29: A confirmation message will show with the database being created.

STEP 4: RUN THE INSTALLATION SCRIPT

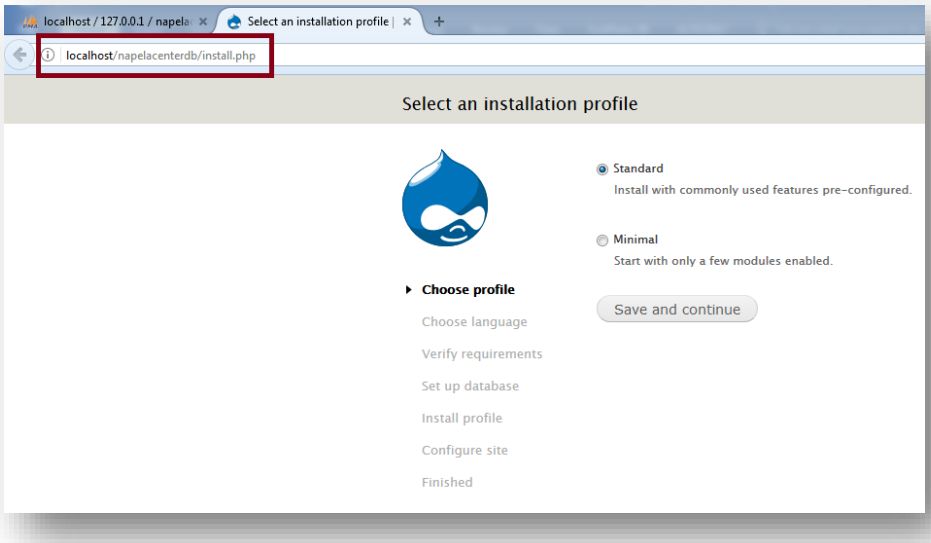


Figure 30: Point the browser to the site: http://localhost/napelacenterdb/ and make sure the profile selected is “standard”.

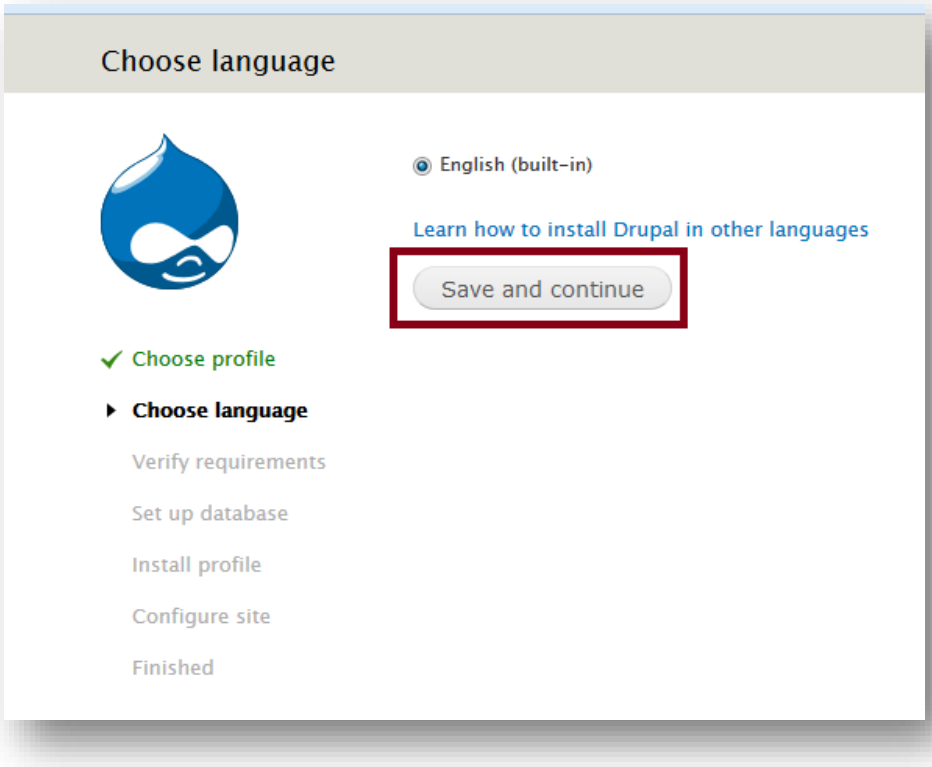


Figure 31: Keep the Drupal default language and continue.

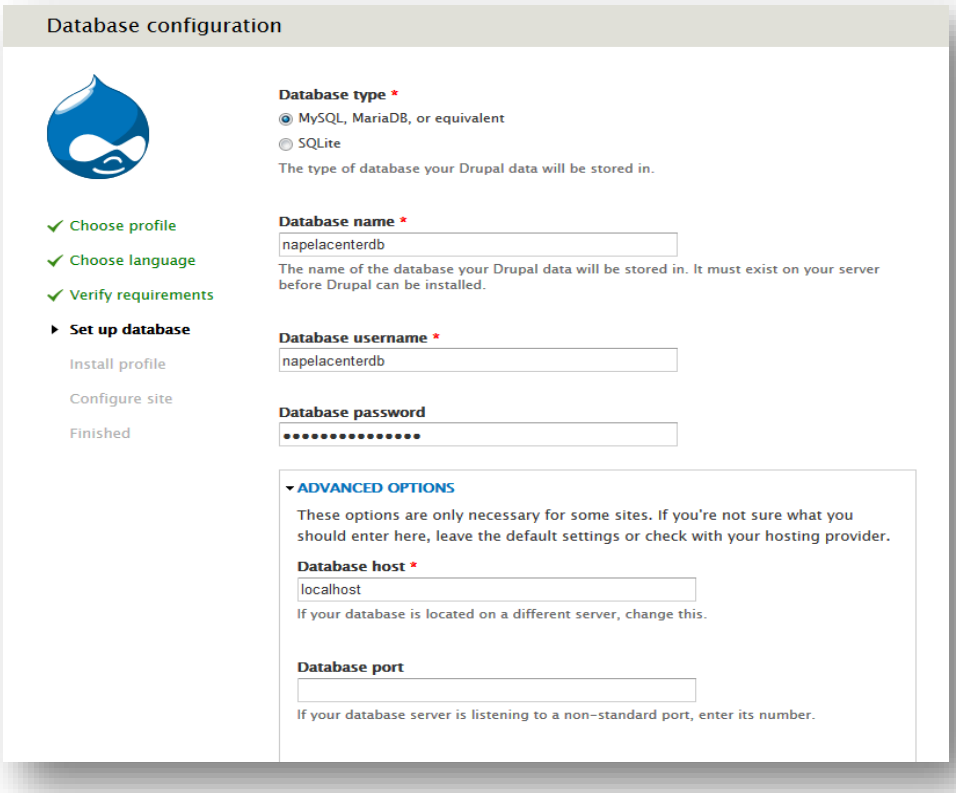


Figure 32: Fill out the database information.

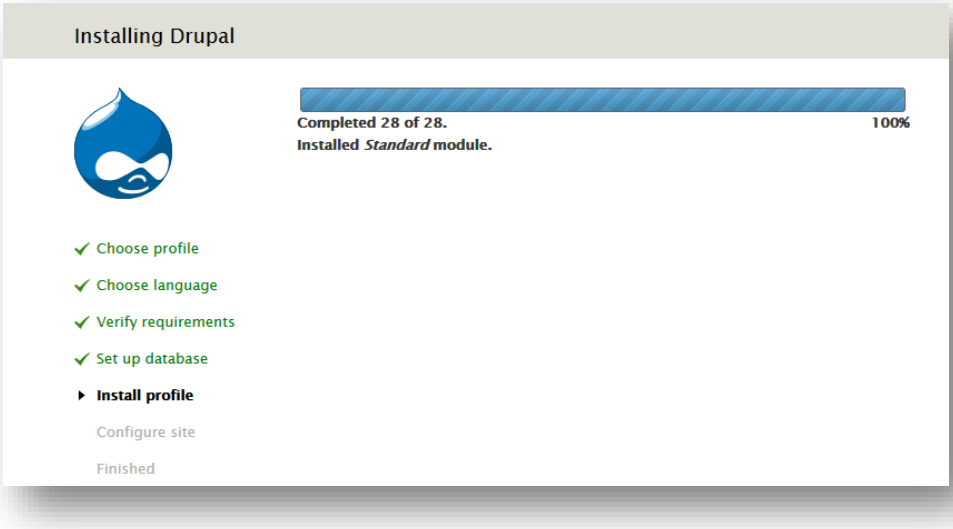


Figure 33: Let the installation complete.

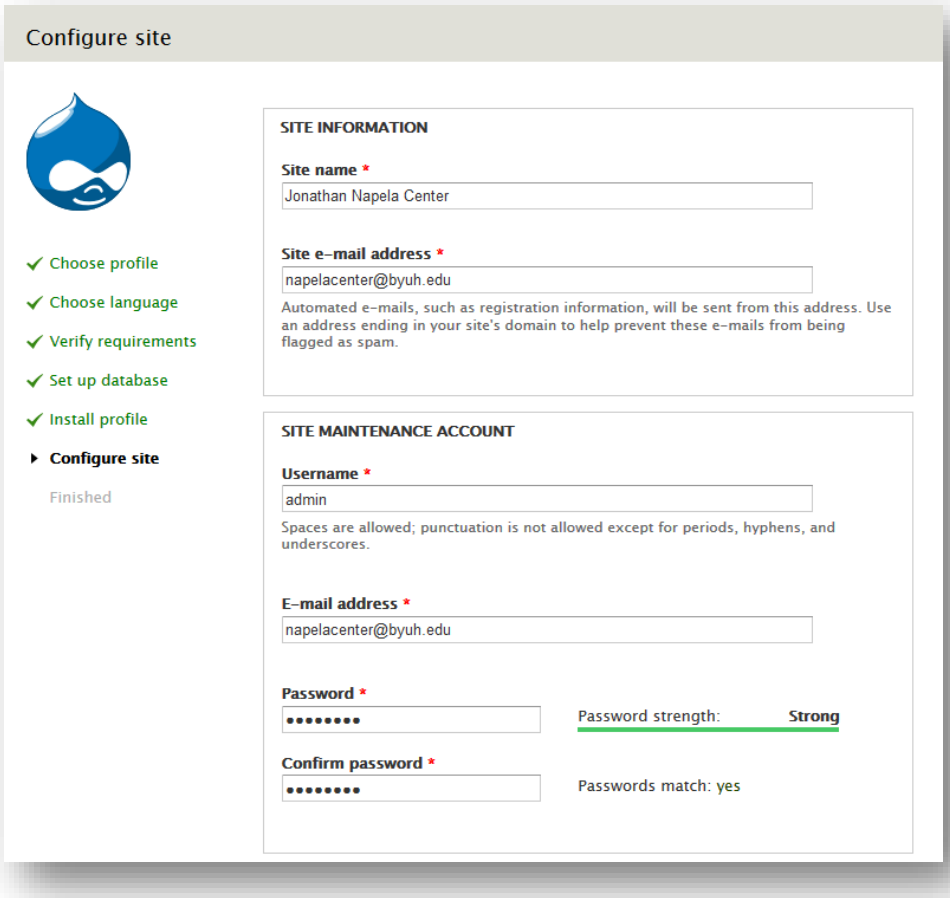


Figure 34: Configure the site.

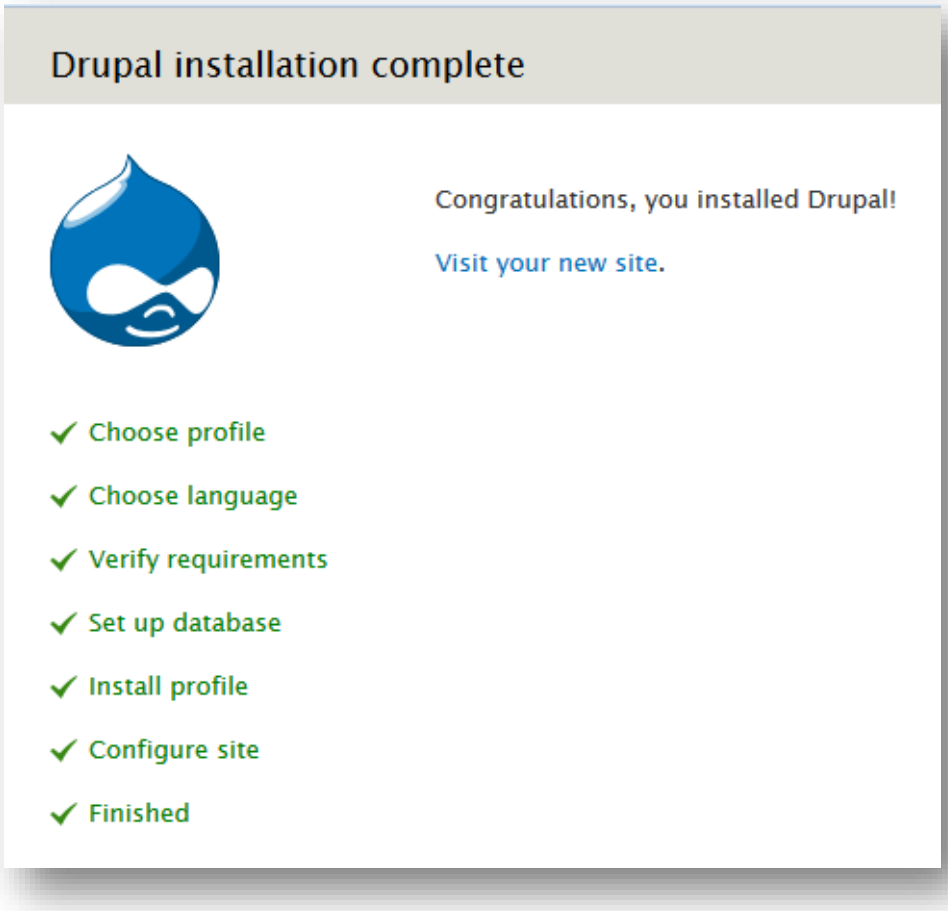


Figure 35: Drupal Installation complete.

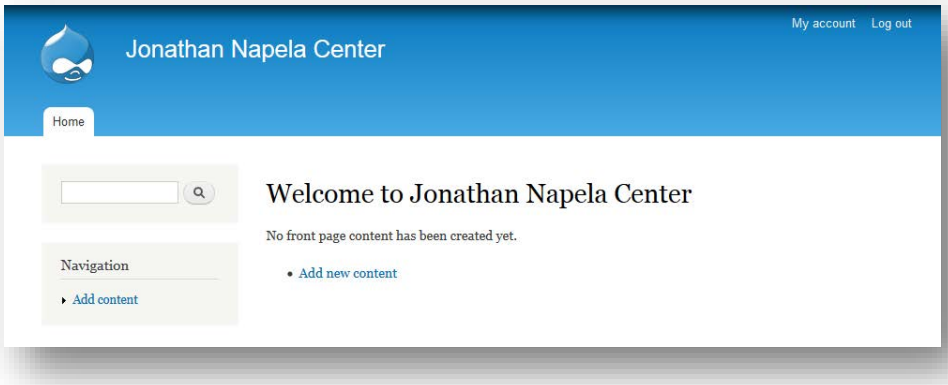


Figure 36: Visit the site

STEP 5: SETTING UP CRON

"Setting up cron is an important step in the installation of the website and assists in the maintenance of the site's assets for search results, checking for updates to Drupal core and modules, and removing temporary files" (Overview, 2016). In my case I decided to use the "automated cron", which is a configuration that is built-in the system. It is located in the following path: Administration>Configuration>System>Cron.

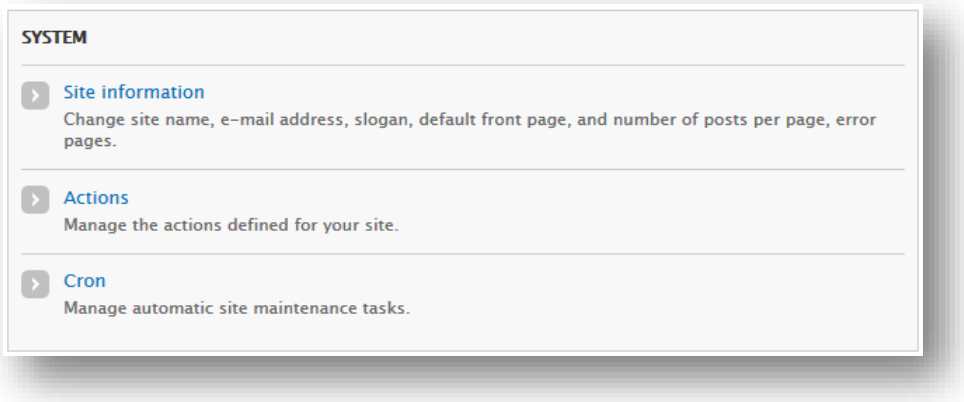


Figure 37: Setting up Cron

STEP 6: CONFIGURE CLEAN URLS

It is important to have a clean URL because not only it "is less intimidating to a human user but when people look at it then they can get an idea of what the page is about" (Hochman, 2016). Again, I used the built-in configuration which is located in the following path: Administer > Configuration > Search and metadata > Clean URLs

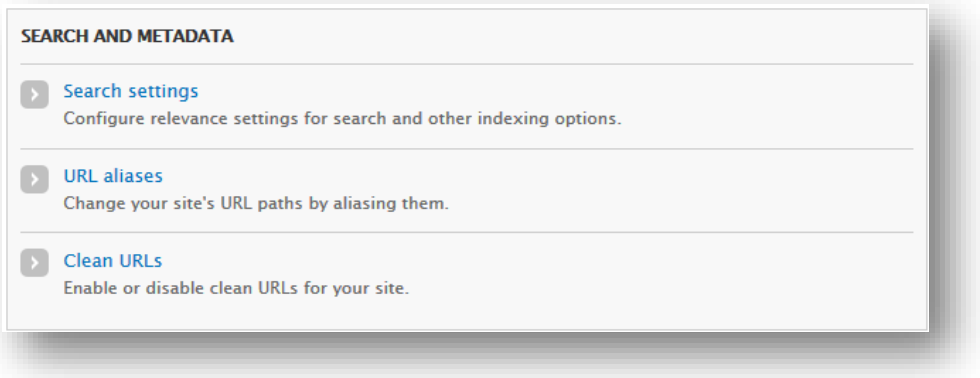


Figure 38: Clean URLs in Drupal.

Creating Contents

In MS Access you normally create tables and fields but in Drupal 7 they call it contents and nodes. To create contents in Drupal 7, you must login as an administrator and do the following:

STEP1: You follow this path: Administration>Structure>Content Types.

STEP 2: “Add content type” and fill out the template. In my case, I only fill out the “Name”, “Description” and “Title Field Label”.

STEP 3: In the “Publishing options” I select “Published” only. Then “Display Settings”, I kept it checked so I know who makes the changes. And last but not the least I turn off Comment Settings because I don’t want anyone to make any comments and then “Save Content type”.

STEP 4: I go back to the content type I just created and “Add new field” or “Add existing field”. Since this will be my first content, I will stick to “Add new field”. But later on when I add more content type I can use “Add existing field” instead of new. I can also edit or delete any label that I don’t want to appear in my content type. For this project, I deleted the label called “Body” and then add my new fields.

STEP 5: Make sure you select a field type for each field and save the content.

STEP 6: Start populating the content with data.

Creating Views

To create views in Drupal 7, you must login as an administrator and do the following:

STEP 1: You follow this path: Administration>Structure>Views.

STEP 2: "Add new view" and fill out the template. For this project I only filled out the view name and change the display format to table. Then select "Continue and edit"

STEP 3: Select the fields/nodes you want to show up in the view.

STEP 4: You can add some fields/nodes to the filter criteria which allows you sort the fields.

STEP 5: Select Page>Settings>Access. This is where you give access restriction as to who can access the views.

STEP 6: Select Pager>Use pager. You can identify how many items that should be display. The default is 10,

Debugging and Testing

Once all the contents and views are created and populated, it is time to do the testing to see if the database meets the objectives of this project.

First Objective: Reduce the number of errors in data entry. With the help of the "Unique Field" module, it prevents multiple nodes from having the same value in a certain field. It is like selecting specific node to be the primary key in each content. The next two tables shows when entered data is successful or duplicated.

Table 5. Successful data entry

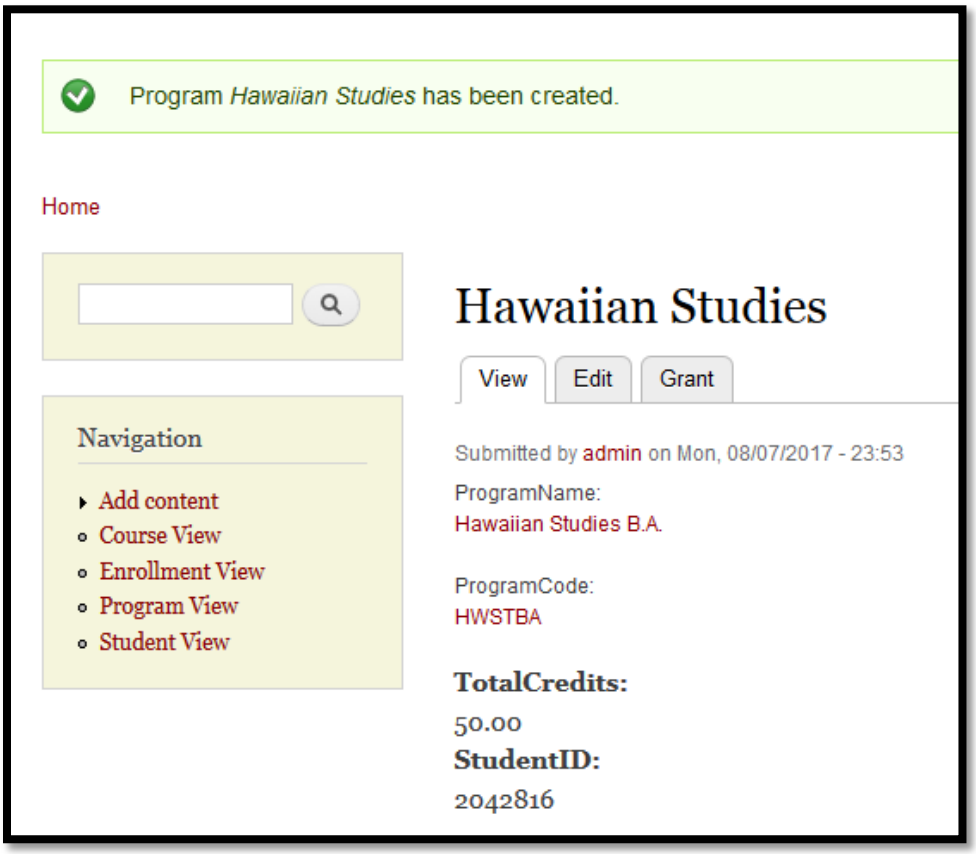
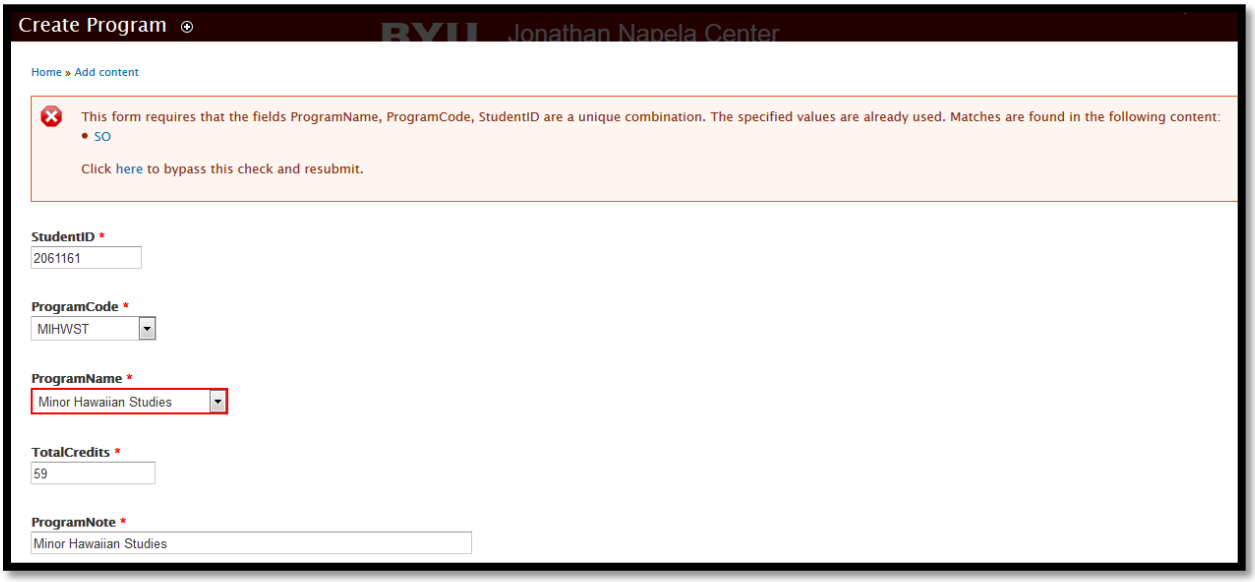


Table 6. Duplicated data entry



Second Objective: To maintain (enter, update, and delete) data on current and past students information. “Views_bulk_operations (VBO)” module enables changes to be done for each content. VBO allows bulk operations such as delete or modify entity values to be executed on the displayed rows. VBO does these operations by showing a checkbox in front of each node and adding a select box containing operations that can be applied. The next four tables shows this operation.

Table 7. Select the content to be changed.

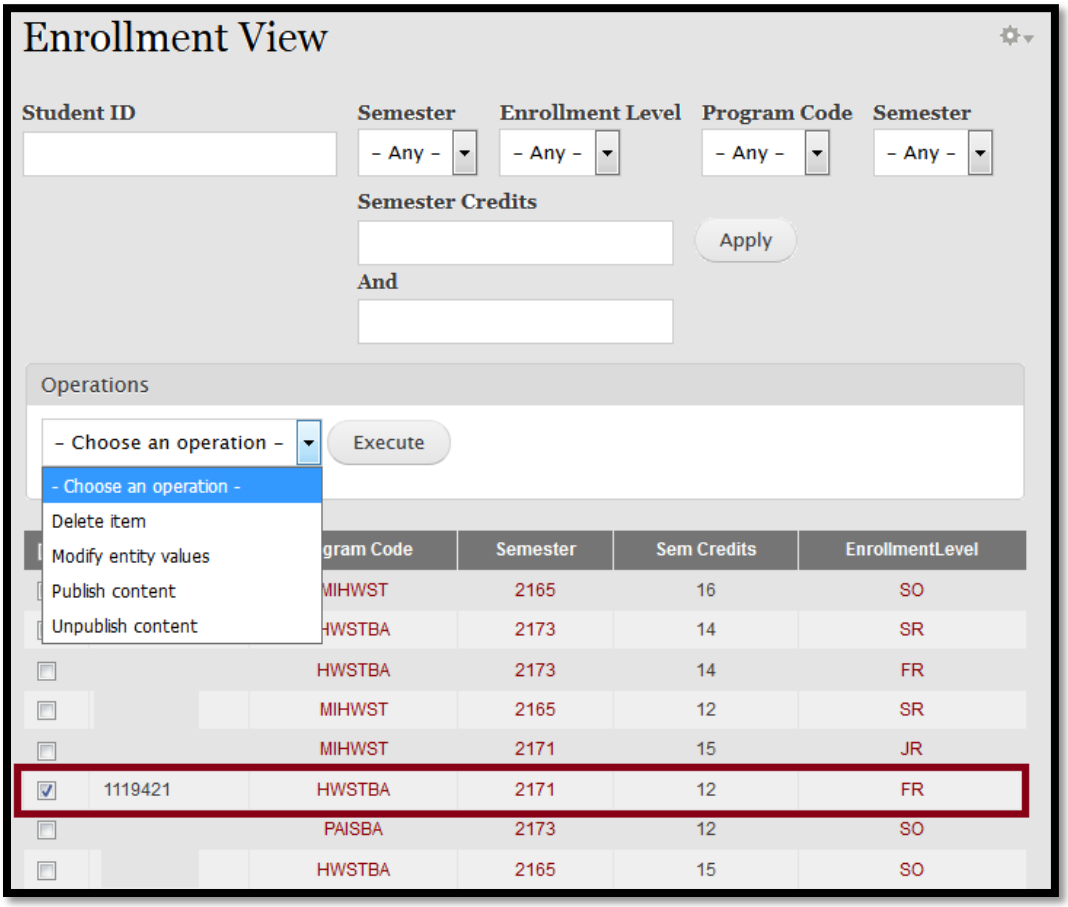


Table 8. Check the field to be change and enter the value.

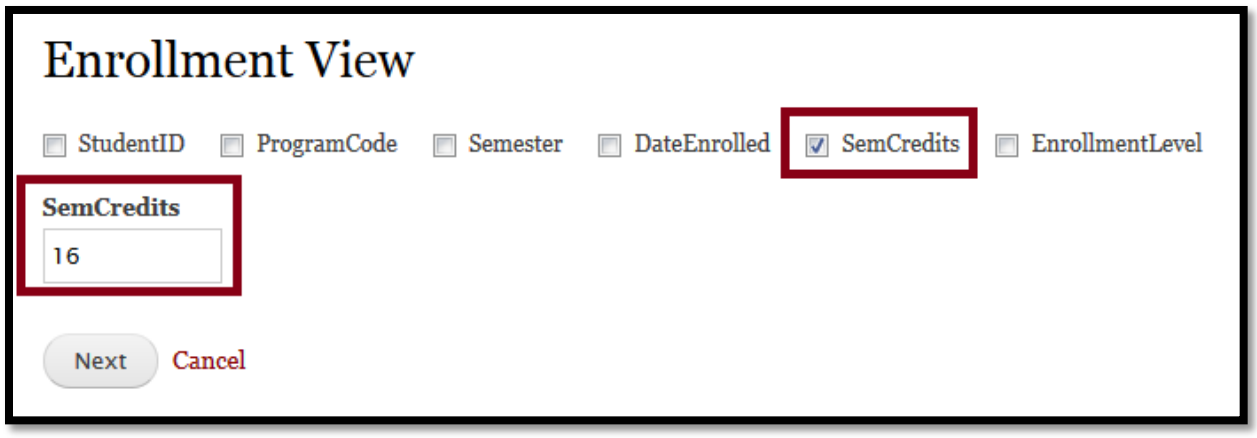


Table 9. Confirm the changes.

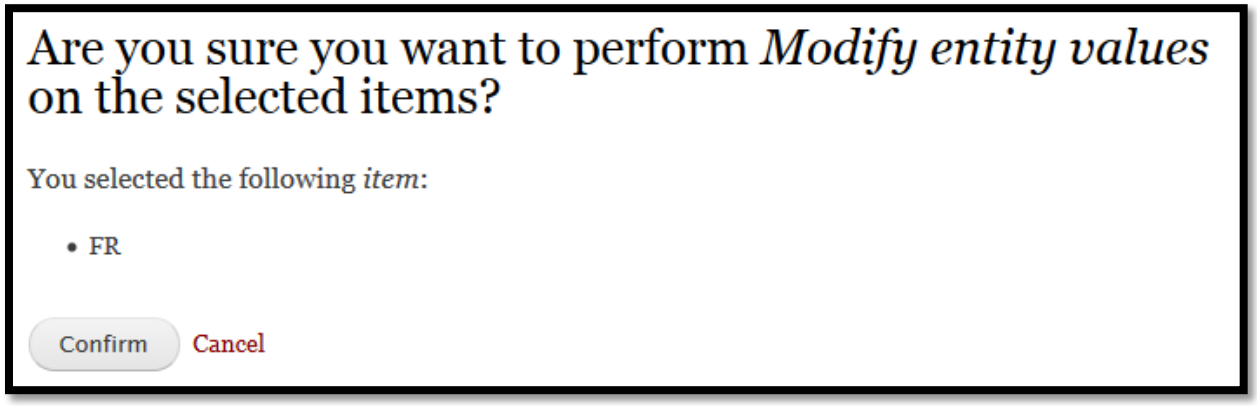
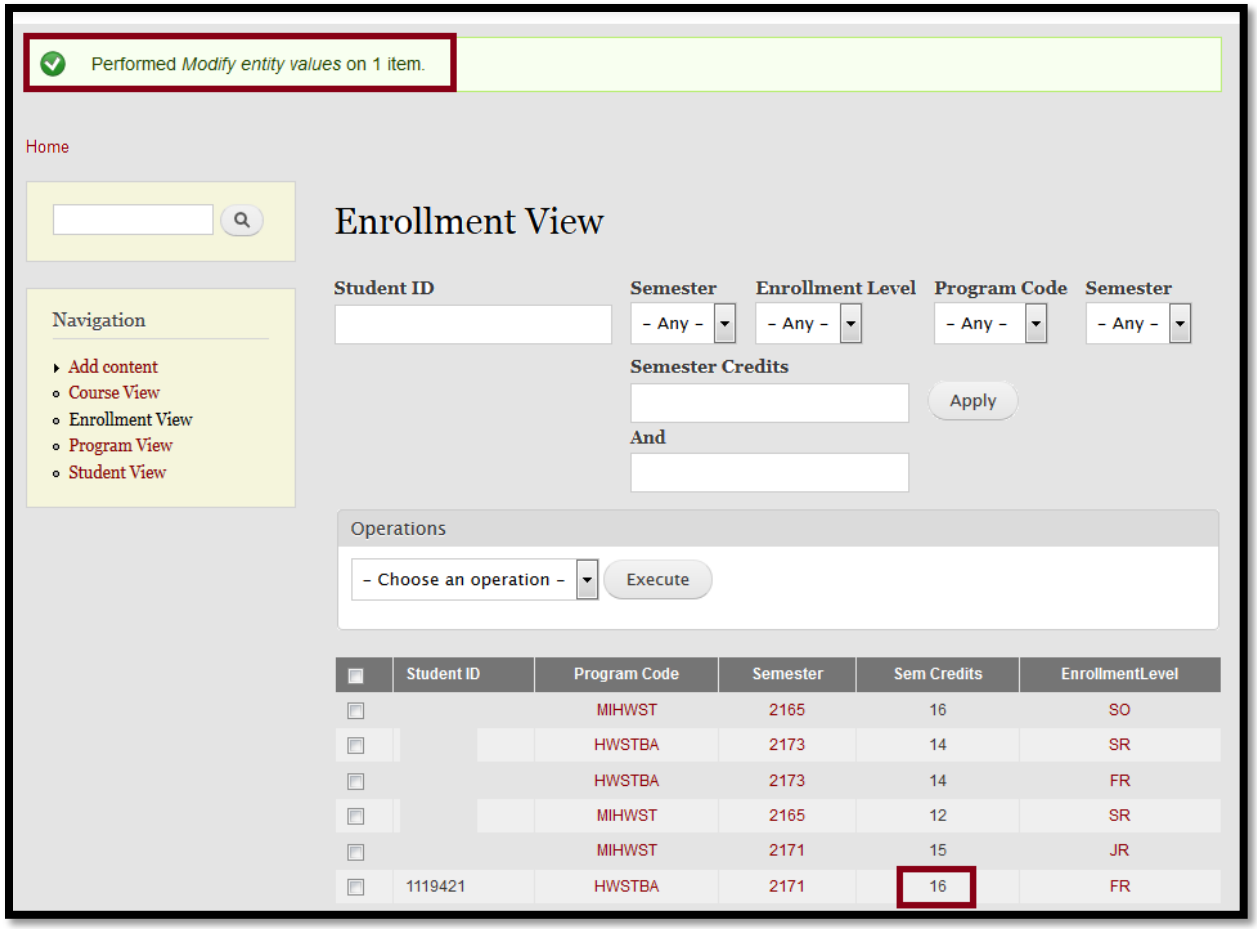


Table 10. Result of the changes made.



Third Objective: To perform searches on students by major, minor, terms, graduation date, GPA and so forth, the “Filter Criteria” in Views will allow you to perform these searches. All you need to do is go to the Structure>Views>Select the view you want to sort and then under “Filter Criteria” you can add all the nodes you want to sort. You can also re-arrange those nodes to the order you want it to appear on the page. The next two tables demonstrate how they are done.

Table 11. Adding Filter Criteria

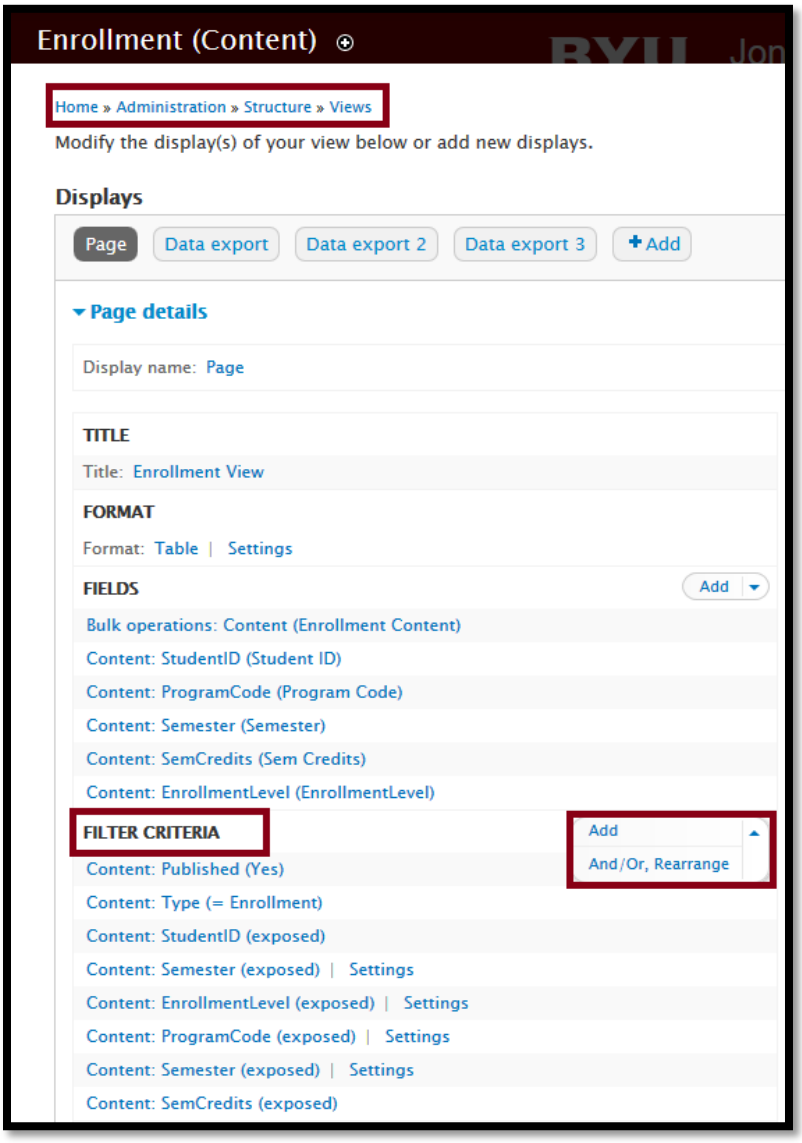
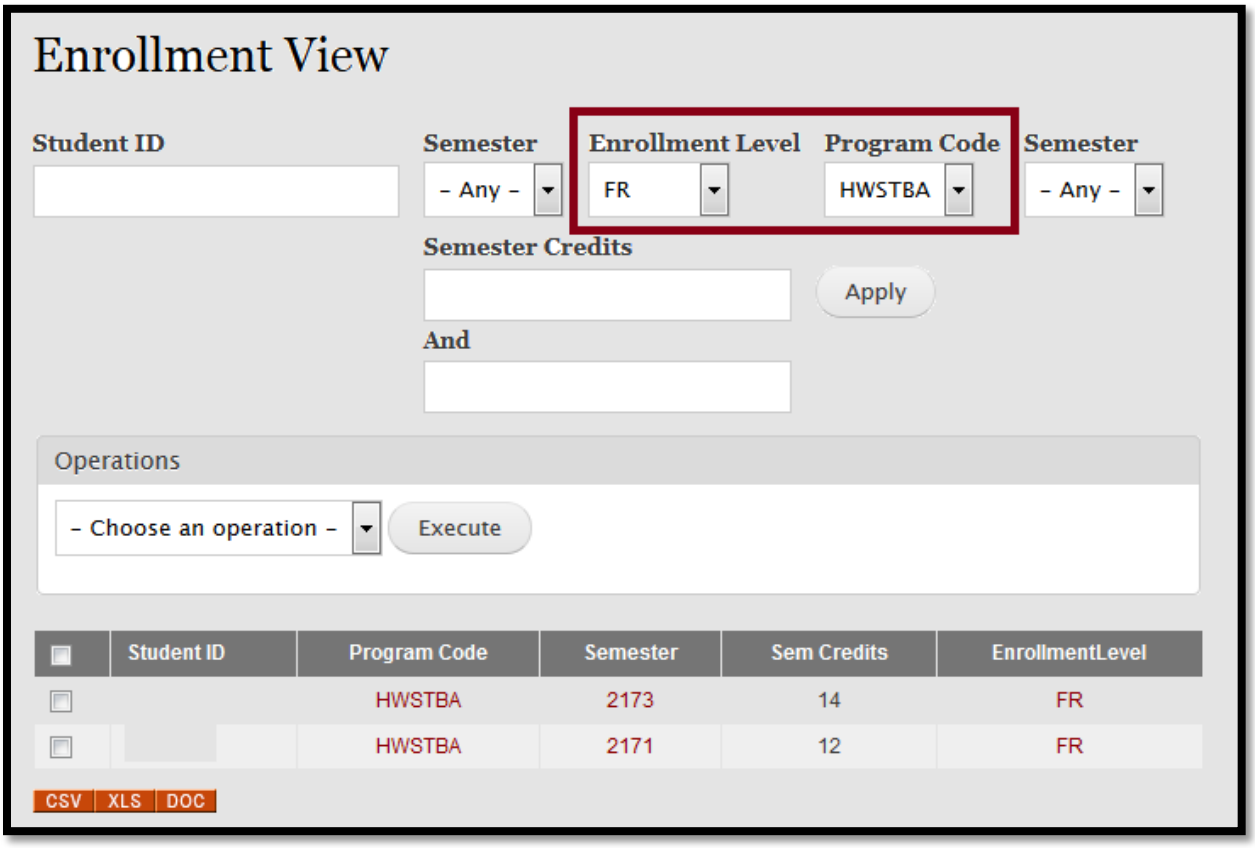


Table 12. Search in Enrollment View for students who are majoring in Hawaiian Studies and are freshmen as level of entry.



Fourth Objective: To track the status of current, graduated and dropout students. This can be done through the Student view. There is a status search criteria that allows you to search for those that are enrolled, graduated or dropout. The next table will demonstrate it.

Table 13. Student View Search

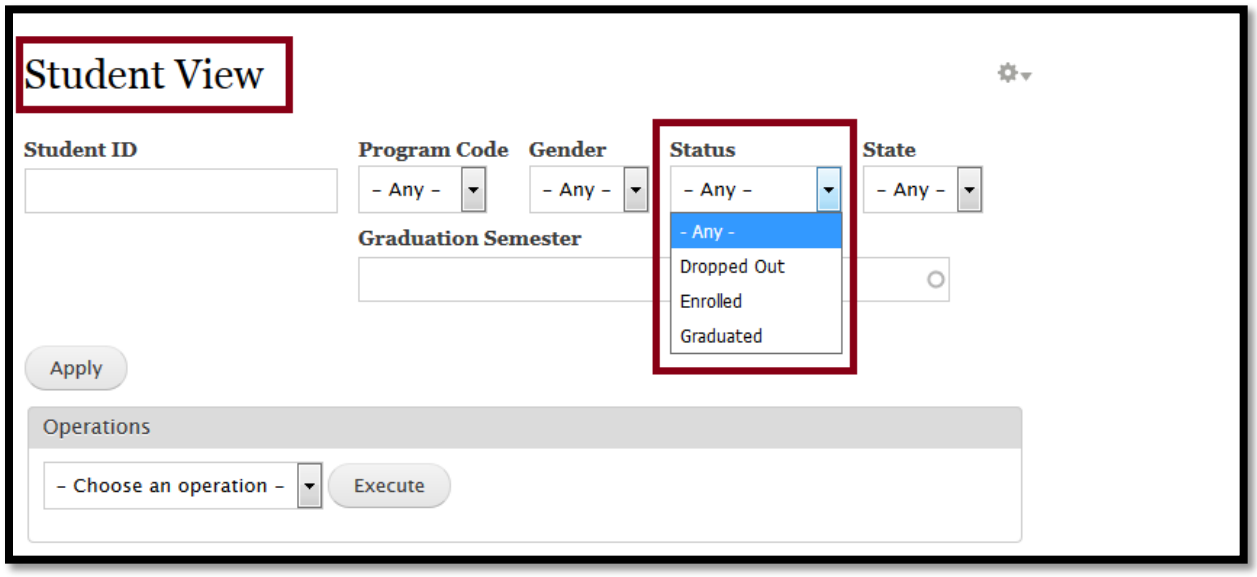
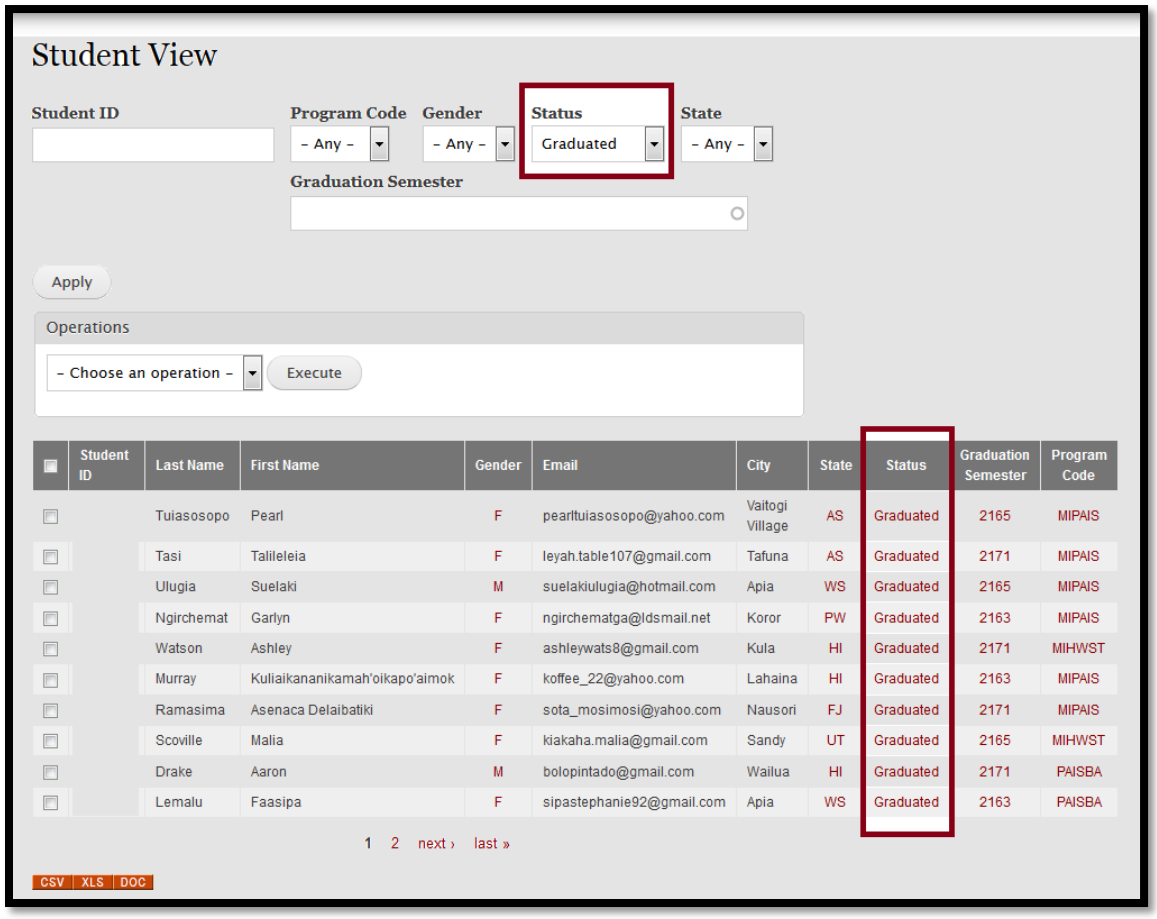
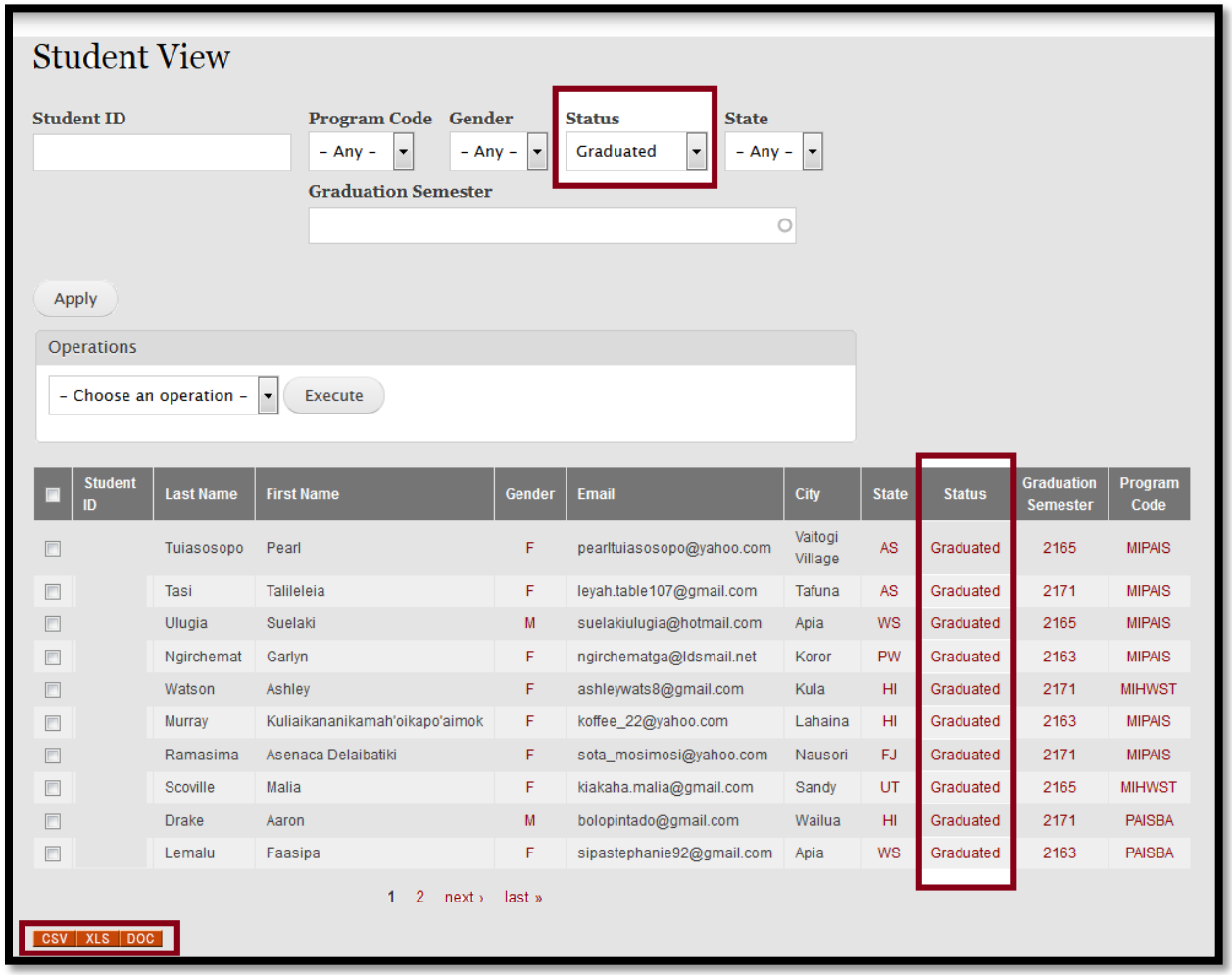


Table 14. Student Result of those that have graduated.



Fifth Objective: To report on current, graduated and dropout student status and history, the "views_data_export" module allows me to export large amount of data from views. There are a few file format available but for this project I will export data to CSV, XLS and DOC. Exporting a report will be demonstrated in the next three tables.

Table 15. Students that have graduated from this department.



Student View

Student ID | Program Code: – Any – | Gender: – Any – | Status: Graduated | State: – Any –

Graduation Semester

Apply

Operations: – Choose an operation – Execute

Student ID	Last Name	First Name	Gender	Email	City	State	Status	Graduation Semester	Program Code
	Tuiasosopo	Pearl	F	pearltuiasosopo@yahoo.com	Vaitogi Village	AS	Graduated	2165	MIPAIS
	Tasi	Talileleia	F	leyah.table107@gmail.com	Tafuna	AS	Graduated	2171	MIPAIS
	Ulugia	Suelaki	M	suelakiulugia@hotmail.com	Apia	WS	Graduated	2165	MIPAIS
	Ngirchemat	Garlyn	F	ngirchematga@ldsmail.net	Koror	PW	Graduated	2163	MIPAIS
	Watson	Ashley	F	ashleywats8@gmail.com	Kula	HI	Graduated	2171	MIHWST
	Murray	Kuliaikananikamah'oikapo'aimok	F	koffee_22@yahoo.com	Lahaina	HI	Graduated	2163	MIPAIS
	Ramasima	Asenaca Delaibatiki	F	sota_mosimosi@yahoo.com	Nausori	FJ	Graduated	2171	MIPAIS
	Scoville	Malia	F	kiakaha.malia@gmail.com	Sandy	UT	Graduated	2165	MIHWST
	Drake	Aaron	M	bolopintado@gmail.com	Wailua	HI	Graduated	2171	PAISBA
	Lemalu	Faasipa	F	sipastephanie92@gmail.com	Apia	WS	Graduated	2163	PAISBA

1 2 next › last »

CSV XLS DOC

Table 16. Exporting report to CSV file.

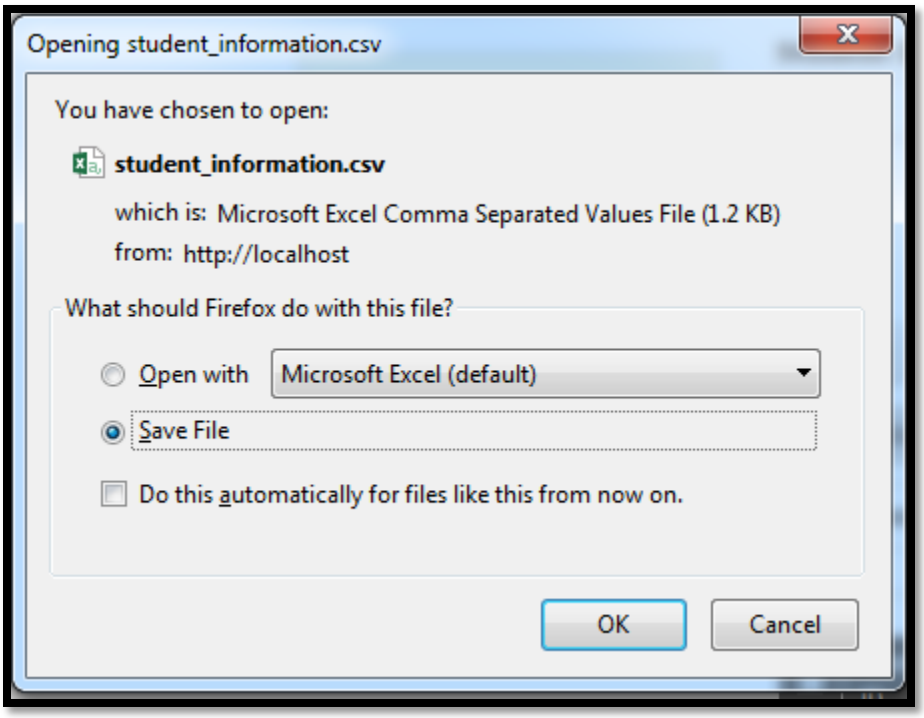


Table 17. Result of exported CSV file report which you can choose the location to save it in.

B	C	D	E	F	G	H	I	J	K
Student ID	Last Name	First Name	Gender	Email	City	State	Status	Graduation Semester	Program Code
	Tuiasosopo	Pearl	F	pearltuiasosopo@yahoo.com	Vaitogi Village	AS	Graduated	2165	MIPAIS
	Tasi	Talileleia	F	leyah.table107@gmail.com	Tafuna	AS	Graduated	2171	MIPAIS
	Ulugia	Suelaki	M	suelakiulugia@hotmail.com	Apia	WS	Graduated	2165	MIPAIS
	Ngirchemat	Garlyn	F	ngirchematga@ldsmail.net	Koror	PW	Graduated	2163	MIPAIS
	Watson	Ashley	F	ashleywats8@gmail.com	Kula	HI	Graduated	2171	MIHWST
	Murray	Kuliaikananikamah'oikapo'aimok	F	koffee_22@yahoo.com	Lahaina	HI	Graduated	2163	MIPAIS
	Ramasima	Asenaca Delaibatiki	F	sota_mosimosi@yahoo.com	Nausori	FJ	Graduated	2171	MIPAIS
	Scoville	Malia	F	kiakaha.malia@gmail.com	Sandy	UT	Graduated	2165	MIHWST
	Drake	Aaron	M	bolopintado@gmail.com	Wailua	HI	Graduated	2171	PAISBA
	Lemalu	Faasipa	F	sipastephanie92@gmail.com	Apia	WS	Graduated	2163	PAISBA

Sixth Objective: To ensure the data is safe and secure in accordance to the Family Educational Rights and Privacy Act (FERPA) of students. According to Chen & Zhao (2012), “It is well-known that cloud computing has many potential advantages and many enterprise applications and data are migrating to public or hybrid cloud”. However, data security and privacy protection is still an issue with cloud computing (Chen & Zhao, 2012). One of the many

benefits that Drupal has is that it allows you to create new accounts with different level of permissions and roles. Before I created any account access to this website, I created two roles. According to Drupal (2001), “Roles allow you to fine tune the security and administration of Drupal. A role defines a group of users that have certain privileges. Examples of roles are: anonymous user, authenticated user, administrator and so forth. To create or edit a role you need to go to the following path: People>Permissions tab>Roles tab. I added “staff” and “technician” roles. Then I created two accounts, “napela_student” with “staff” role and napela_web” with “technician” role.

Table 18. Add Role.

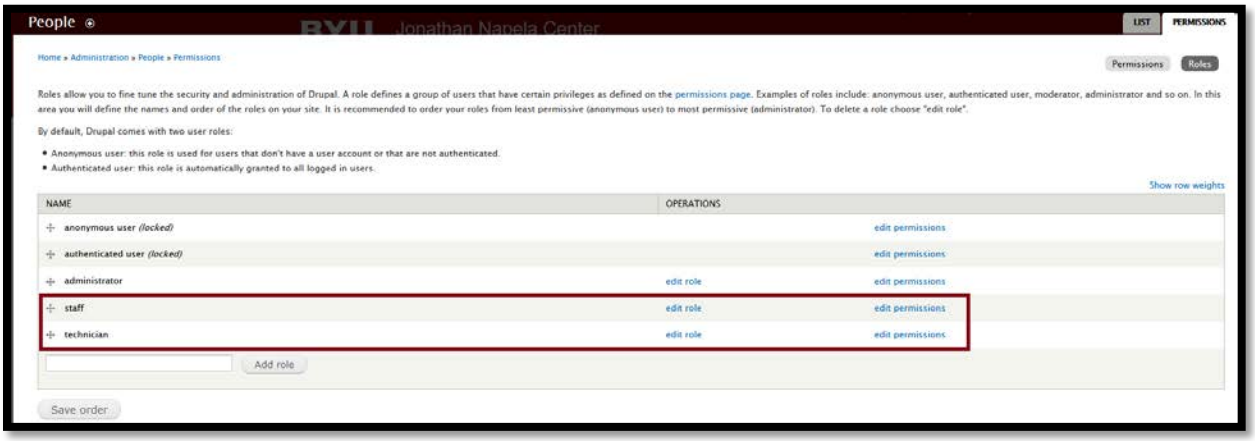
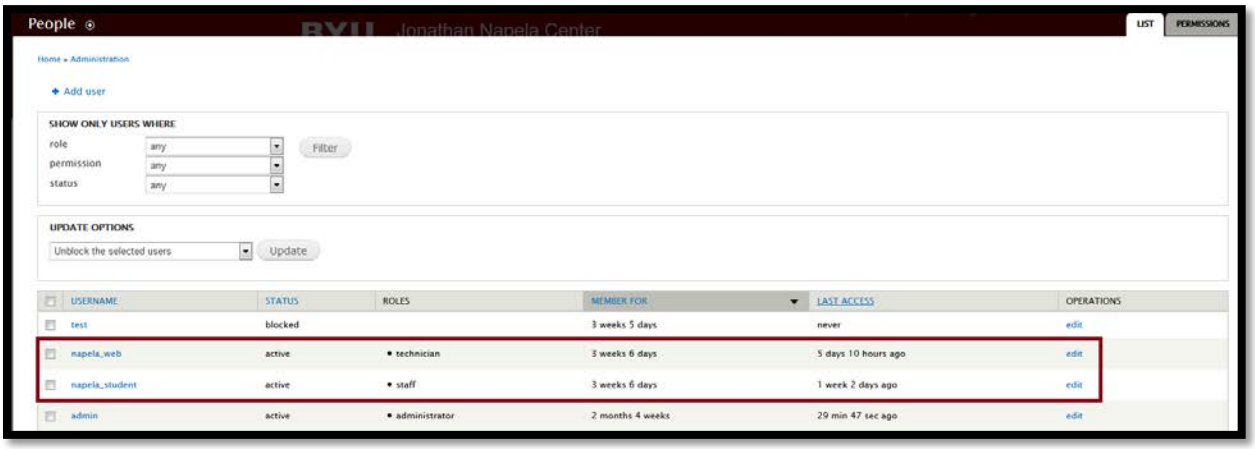


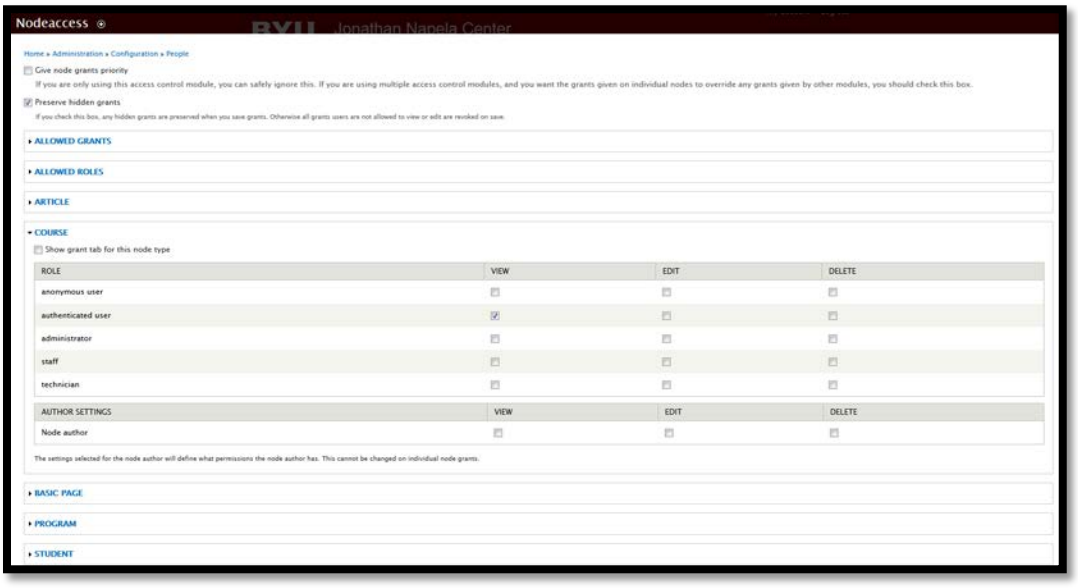
Table 19. Create Accounts.



As for the “staff” role, I gave it the permission to create and edit nodes. For the “technician” role, I gave the same permission as the “staff” plus the following permissions: Backup and Migrate, Taxonomy and Webform. “Backup-migrate” module allows you to back up your database and restore them whenever you need to. “Taxonomy” module gives your site organizational keywords such as categories, tags or metadata. It allows you to connect, relate and classify your website’s content (Drupal, 2001). “Webform” module allows you to create forms and surveys in Drupal.

“Nodeaccess” module grants view, edit and delete access to each node. “Users with the ‘grant node permissions’ permission will have a grant tag on node pages with allows them to grant access to that node by user or role. Administrators can set default access controls per content type” (Drupal Association, 2001). To access this you follow this path: Administration>Configuration>Nodeaccess. Not only this website is locked down to specific user and permissions, once deploy on campus, it can only be accessed through the BYUH network.

Table 20. Nodeaccess



CHAPTER FIVE: CONCLUSIONS

"Today, more than at any previous time, the success of an organization depends on its ability to acquire accurate and timely data about its operations, to manage this data effectively, and to use it to analyze and guide its activities" (Ramakrishnan & Gehrke, 2000).

I strongly agree with Ramakrishnan & Gehrke because at the end of this project, I have learned the importance of a database management system (DBMS). I learned that a DBMS can manage data more efficiently and at the same time allow users to perform multiple tasks with ease. I am also aware that security has always been a great concern for any information that is accessed on the web. And maybe sometime the reliability on the internet can be slow or the web application can face unpredictable and potentially enormous peak loads and so forth. Although, Web Based Database has its flaws and limitation, I still think that its benefits will help the Napela Center more compared to their current system.

I was able to build the DBMS for the Napela Center and it wasn't easy but it was worth it. With this new system in place, Napela Center will be able to accomplish a lot of things such as reduce data duplication, maintain student information, perform student searches, track student status, export data report and knowing that their data will be safe. Not only that this database can be accessed with proper login but it can only be accessed internally through the BYUH network and not off campus. This DBMS has met the objectives that has been underlined for this project as explained in the debugging and testing stage. I think that this will fit the Napela Center because there will be no need for specialized HTML knowledge or expertise to change or update the website. The maintenance of this database can be done by anyone in the Napela Center that is willing to learn. This person can be trained.

For future studies, I think that the need for DBMS will always be there. The only thing I am not sure of is whether Oracle/SQL Server will still be the leading database application like today. However, the future of DBMS will always be radiant due to the high demand of capturing data for research, analysis and decision making.

REFERENCES

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APPENDICES

APPENDIX A: USERS' MANUAL

Most of the changes to the website will be mainly done in the Structure tab. If there will be any updates made on the Structure tab, it will be most likely the Content Types, Views and Taxonomy. In Taxonomy, you can "Add vocabulary" or edit them through the operations made available for each vocabulary. Most of the nodes I created in the contents that has drop down features are created in Taxonomy. There are some vocabulary tag that you might want to update regularly such as State Tag, Course Name Tag, Course Code Tag and Semester Tag and so forth.

WORK BREAKDOWN STRUCTURE

Requirements Analysis

- Meet with department and those involve in the project.
- Learn the current system.
- Understand the problem to be solved.
- Requirements and expectations of the users are collected and analyzed.
- With collected requirements, new system need to be understood.

Design

- Design a schema diagram for the database.
- Database Design
- Database Processing Flow Chart

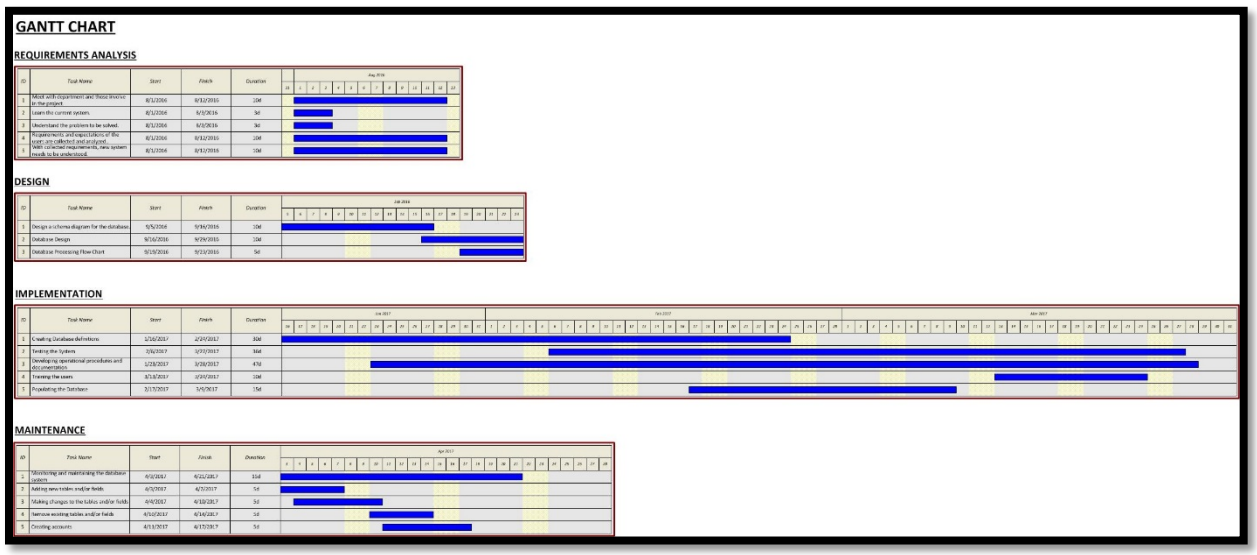
Implementation

- Creating Database definitions
- Testing the System
- Developing operational procedures and documentation
- Training the users
- Populating the Database.

Maintenance

- Monitoring and maintaining the database system
- Adding new contents and/or nodes and views
- Making changes to the contents and/or nodes and views
- Remove existing contents and/or nodes and views
- Creating accounts

GANTT CHART



APPENDIX B: SYSTEM TECHNICAL DOCUMENTATION

Monitoring and maintaining the database system

There are times when the database needs to be updated. There are two ways to do it. First, you can type on the URL //localhost/napelacenterdb/update.php and then it will run the update for you. Just follow the instruction on the screen.

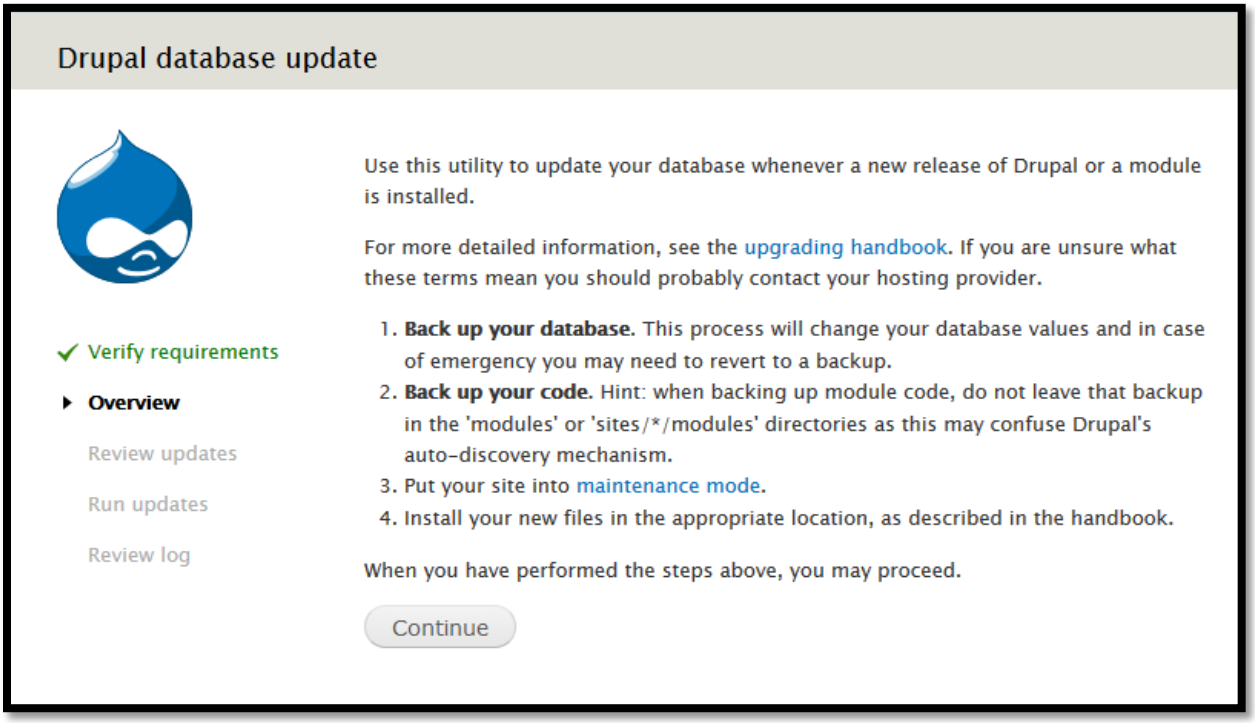


Figure 39: Use update.php to update the website.

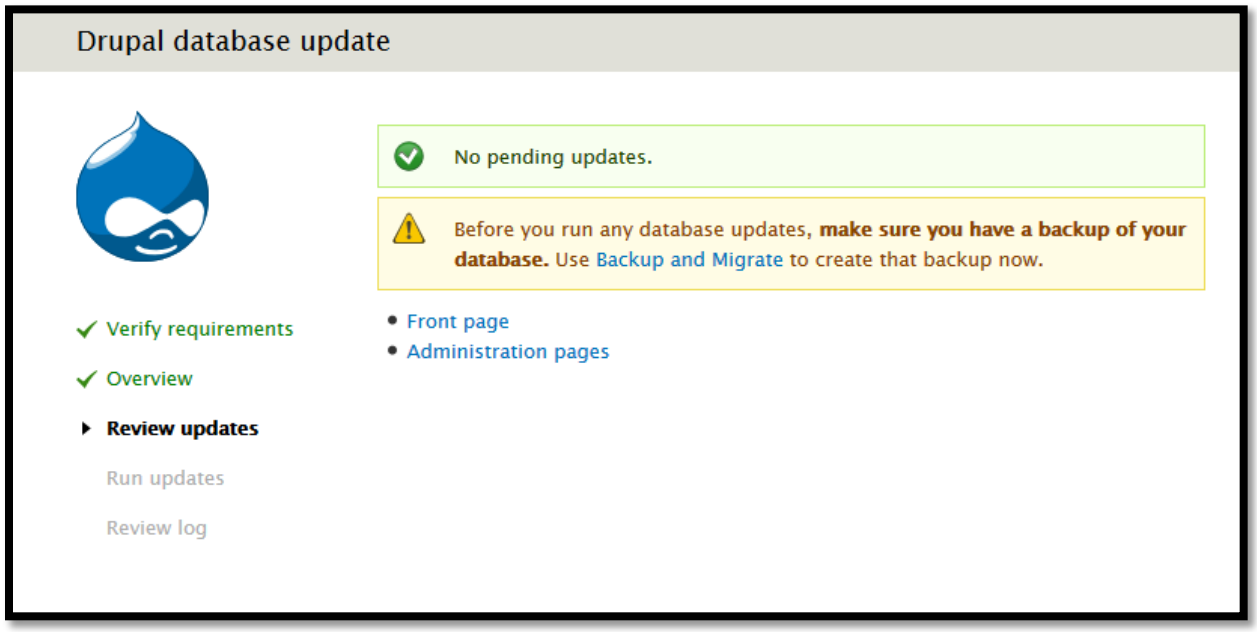


Figure 40: DB Update completed

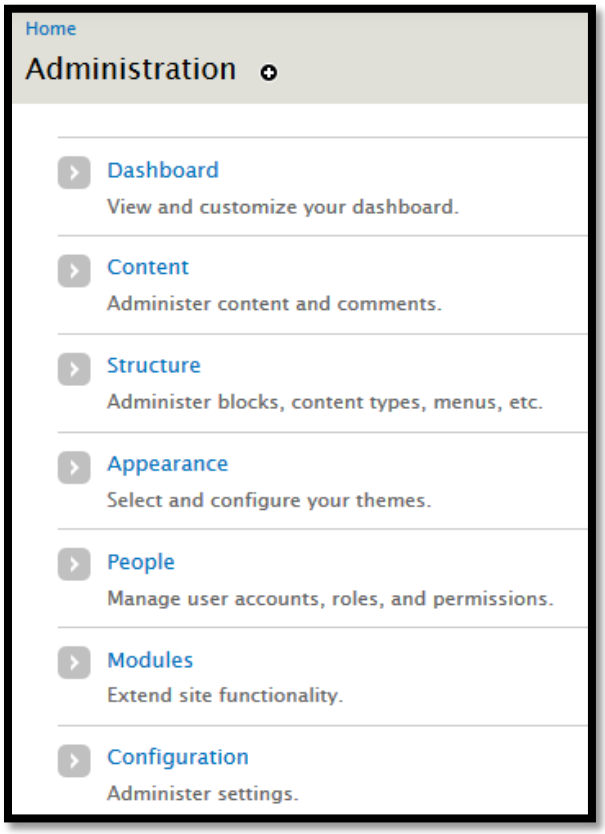


Figure 41: After update, select the Administration link. Should be something like this.

The second option is that you can run the Cron manually. You can do this by following this path: Administration>Configuration>System>Cron. Currently, I set the Cron to run every 3 hours.

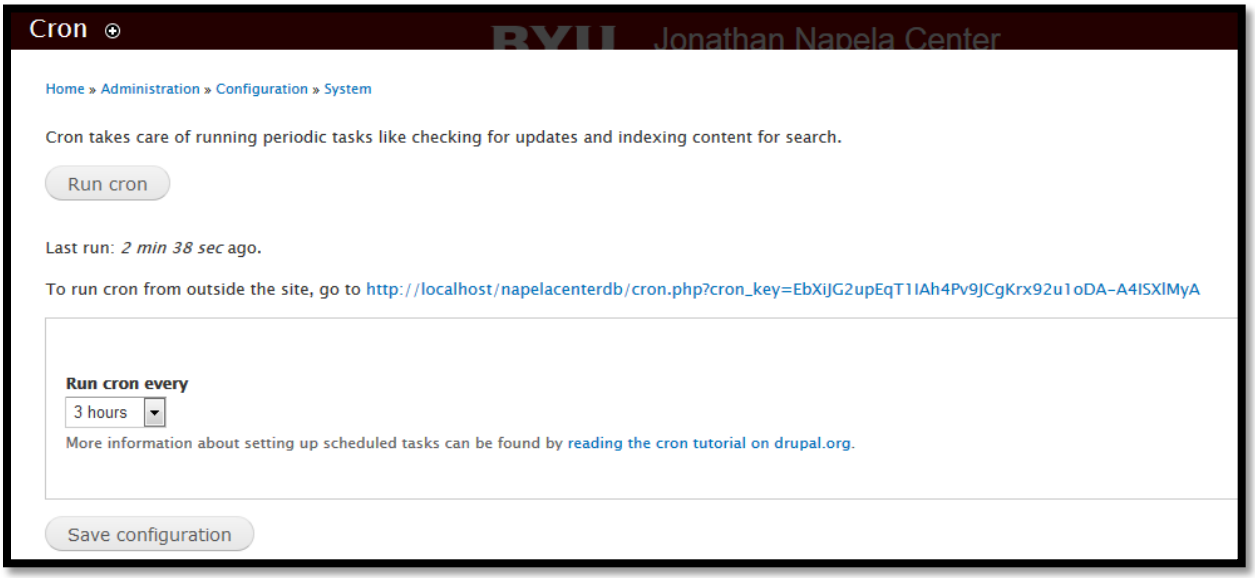


Figure 42: Run Cron

Adding new contents and/or nodes and views

Adding a new content or view has been discussed earlier in this paper. However, I will only show some figures here as to what it looks like on the website.

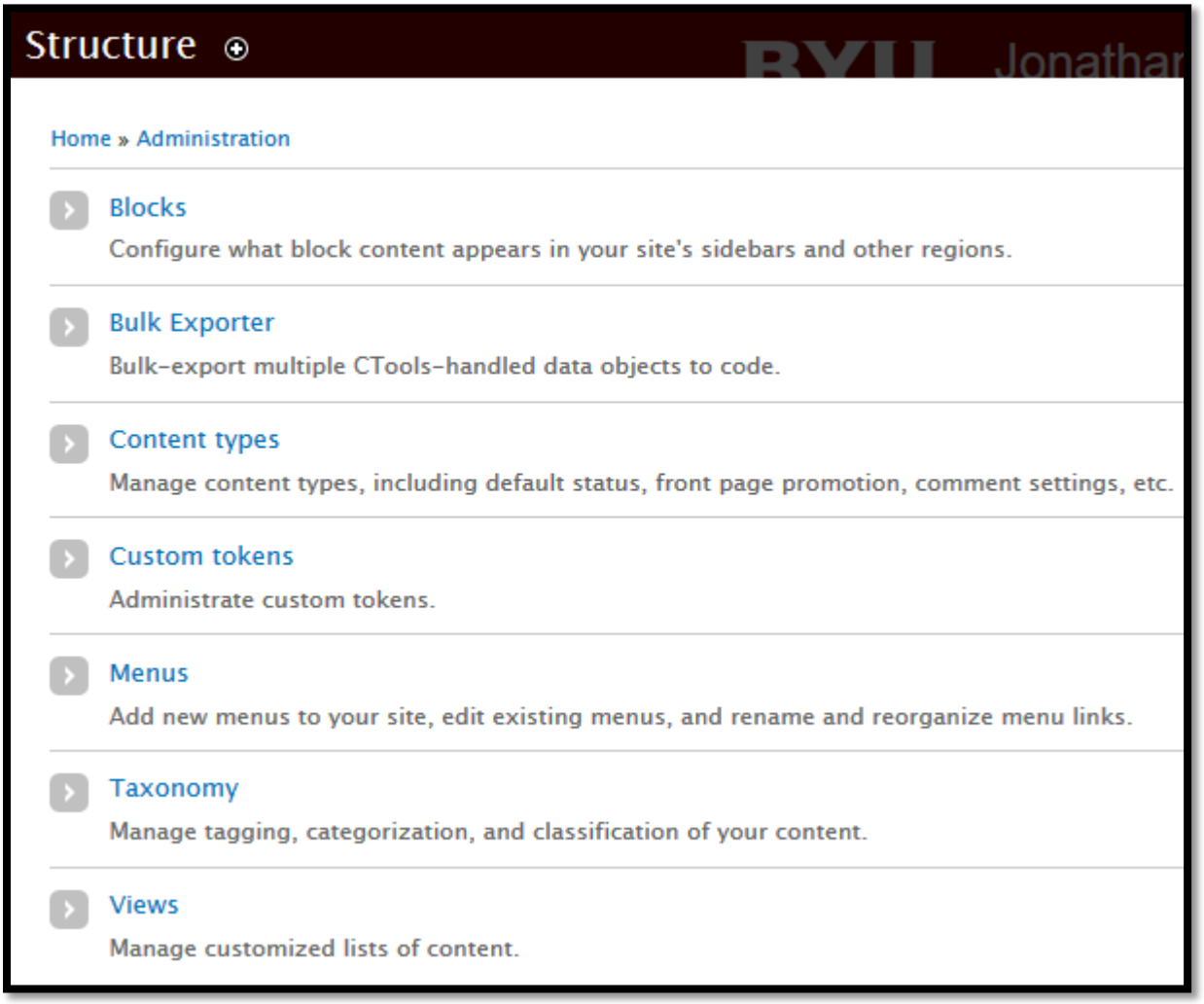


Figure 43: Select Structure and then you can decide if you want to create “Content types” or “Views”.

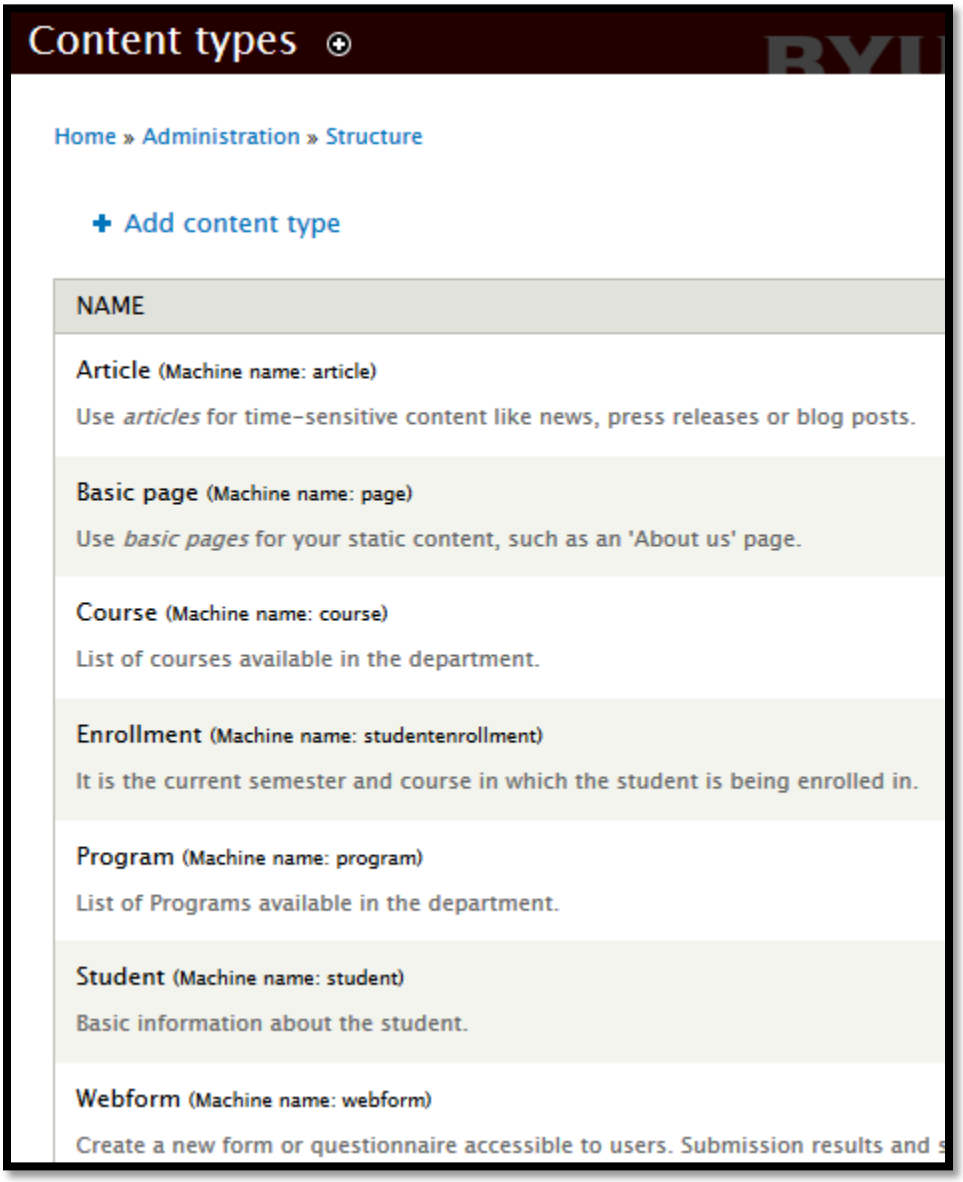


Figure 44: Creating a new Content Type.

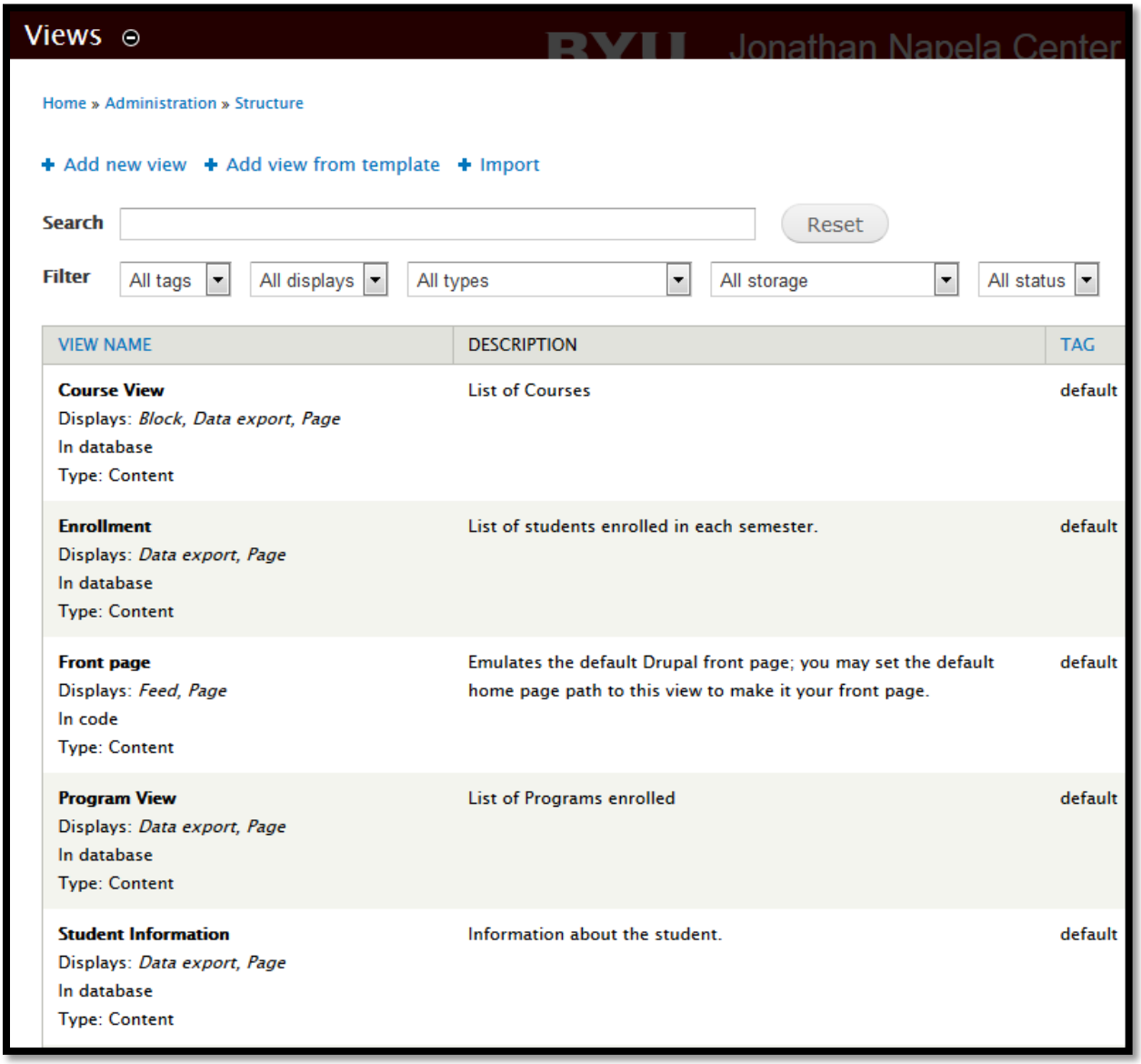


Figure 45: Adding a new View

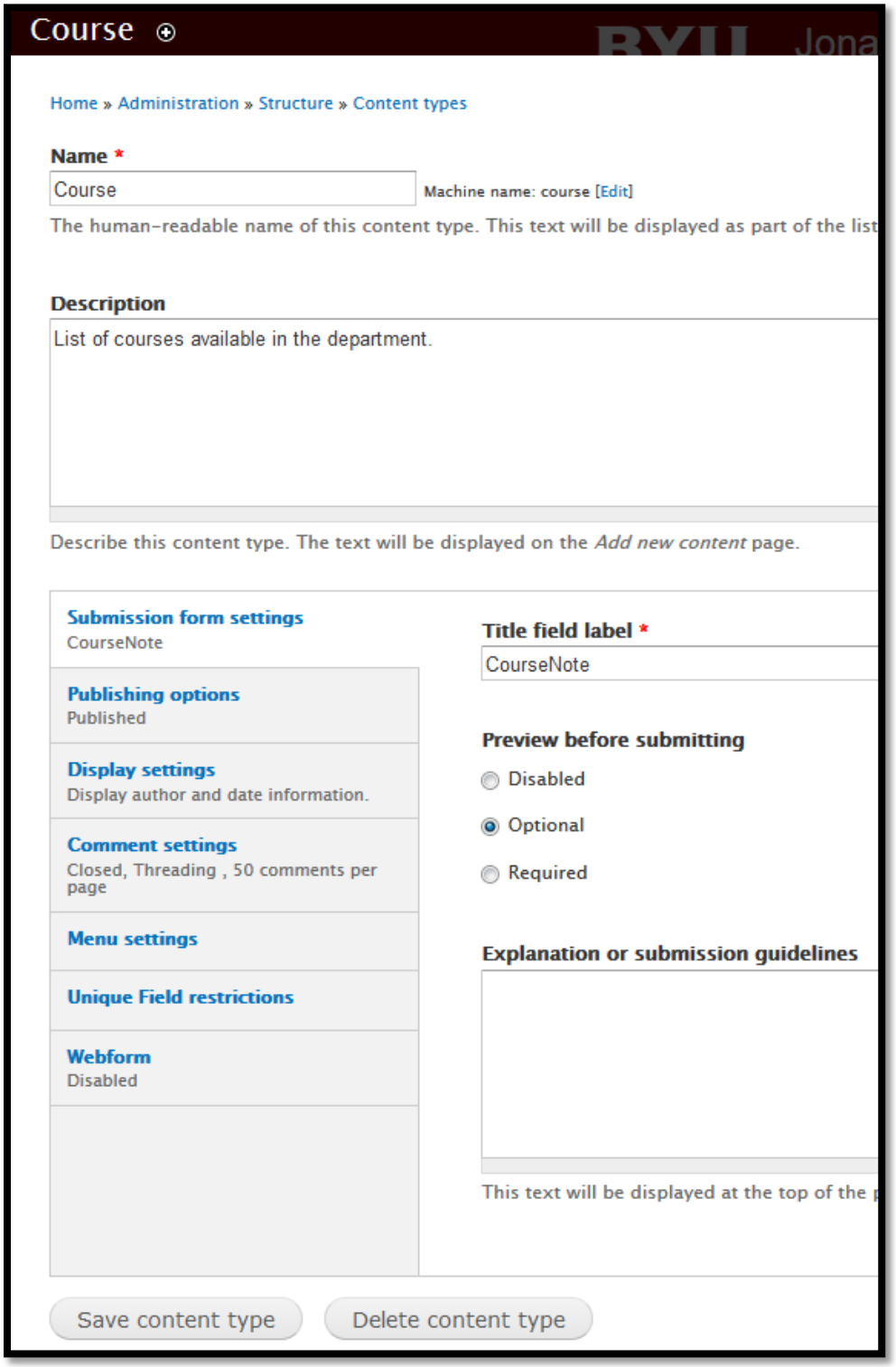


Figure 46: Filling out a Content Type template.

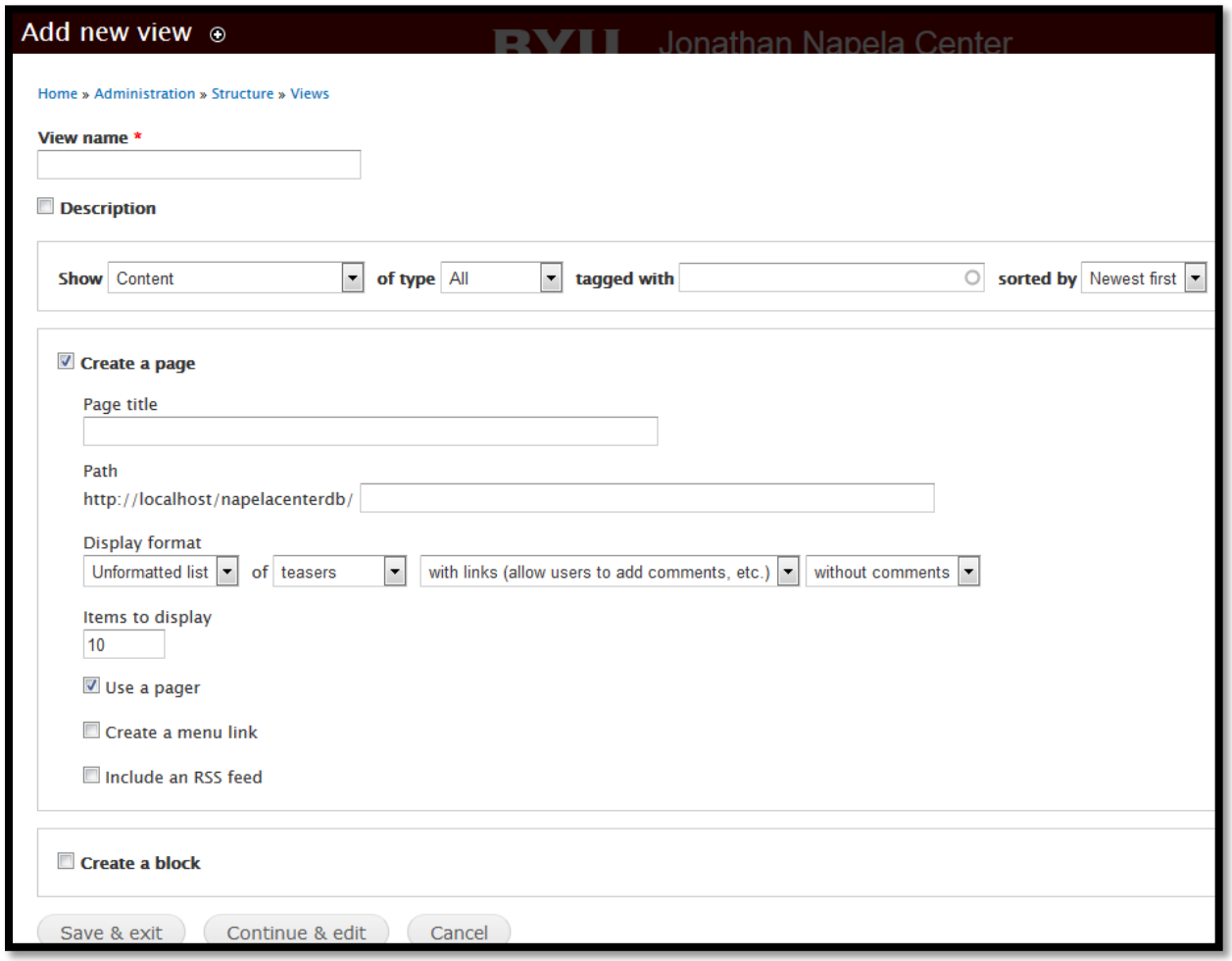


Figure 47: Filling out a View template.

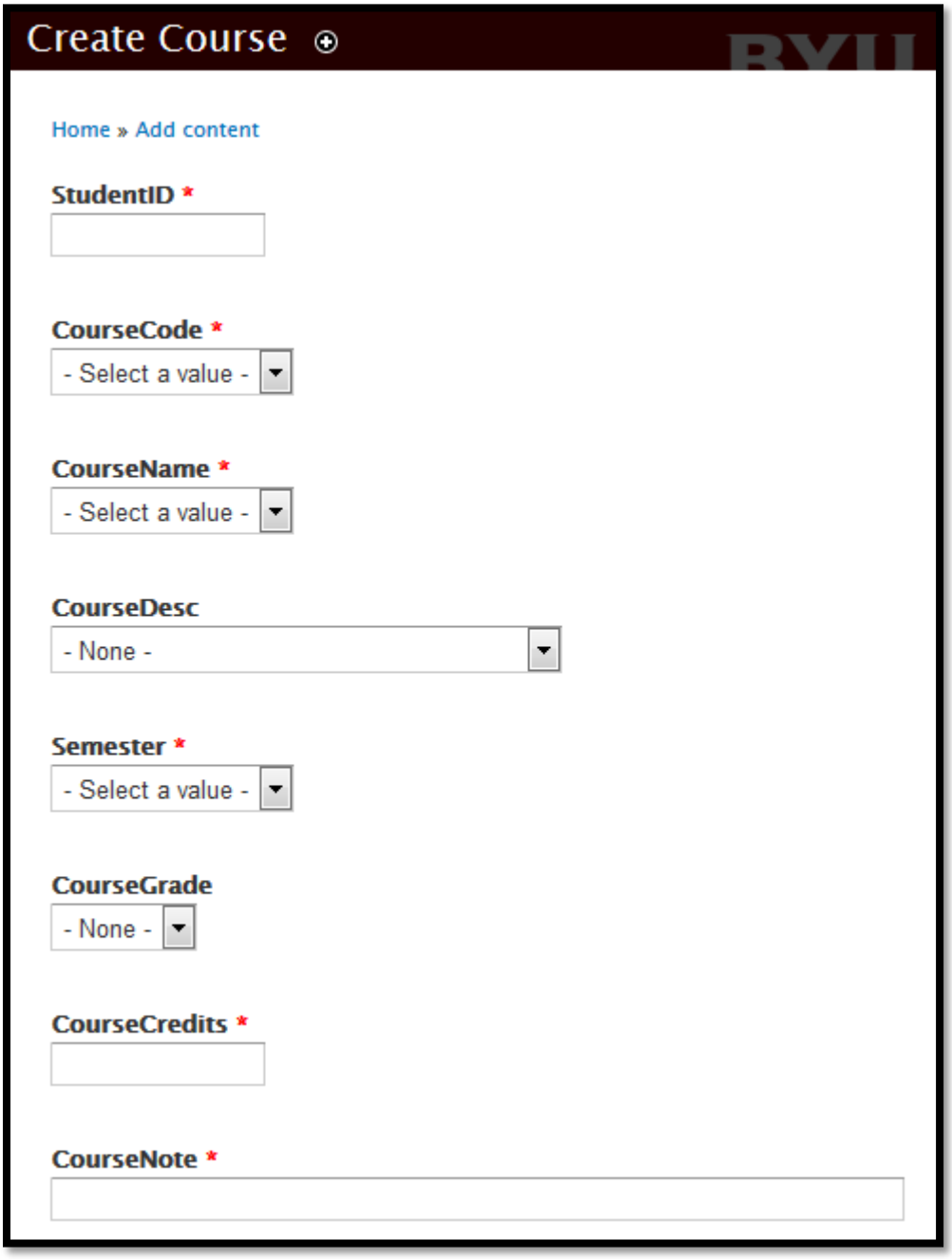


Figure 48: Result of a Content Type.

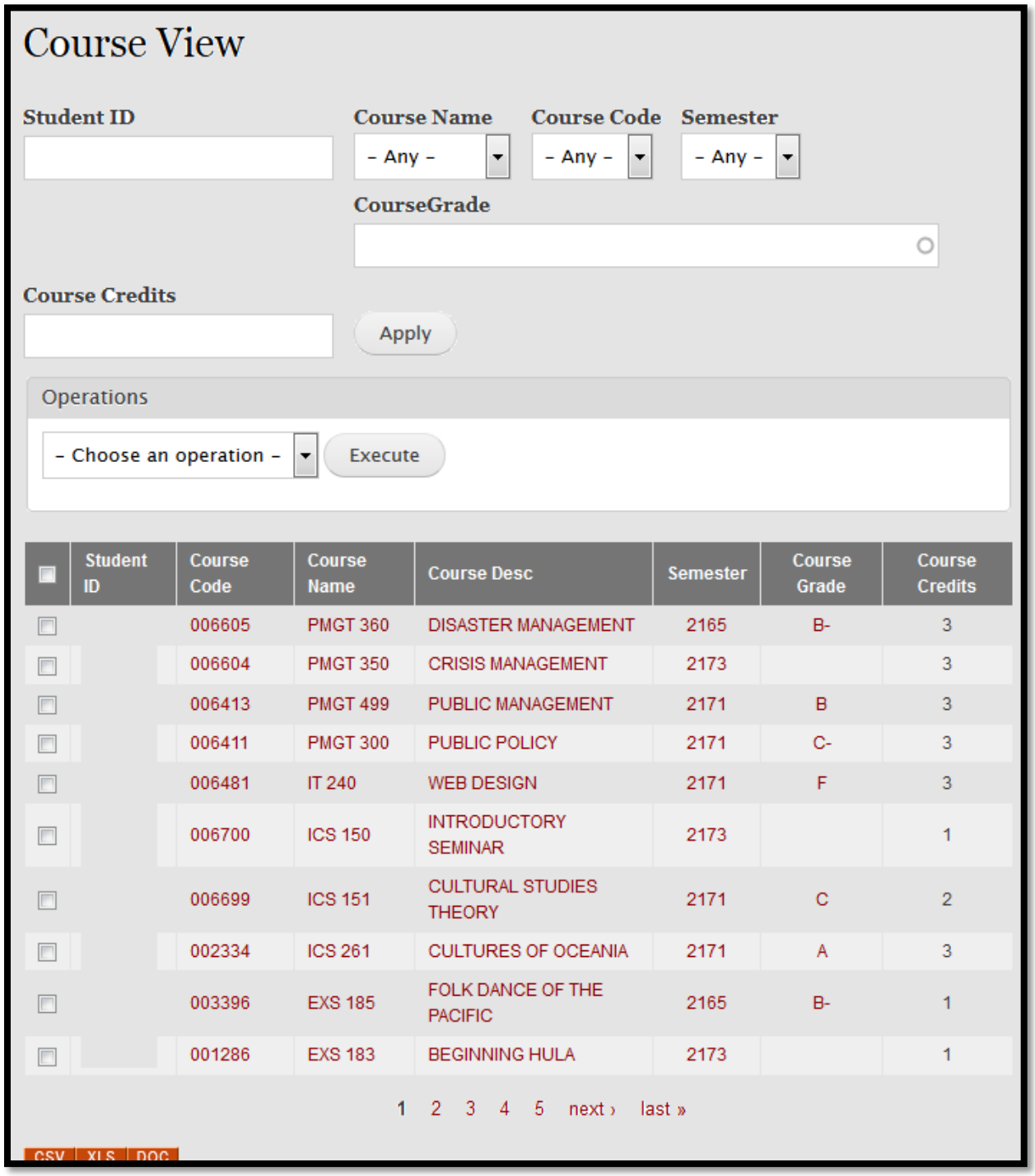


Figure 49: Result of a View

Making changes and removing the contents and/or nodes and views

In Drupal 7, making changes and removing a content type or view is very simple. All you need to do is go to Structure>View or Content Types and you will see a set of operations available for you to select. These sets of operation has “edit” and “delete” made available for you to use.

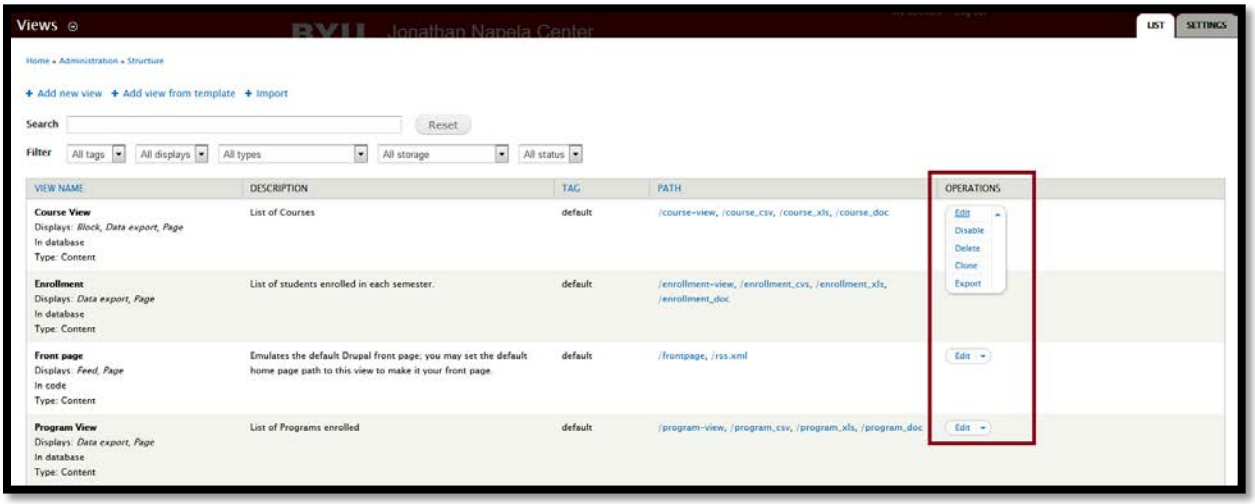


Figure 50: Views Operations

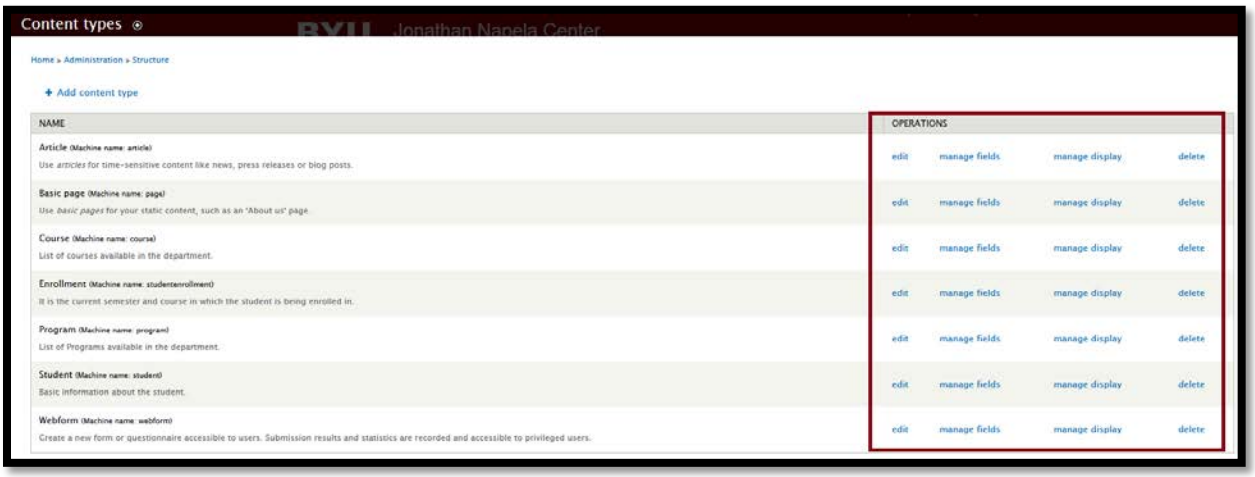


Figure 51: Content Types Operations

Creating accounts

Creating a new user account has been introduced in the testing and debugging stage. To accomplish this task you must go to Administration>People>Add User.

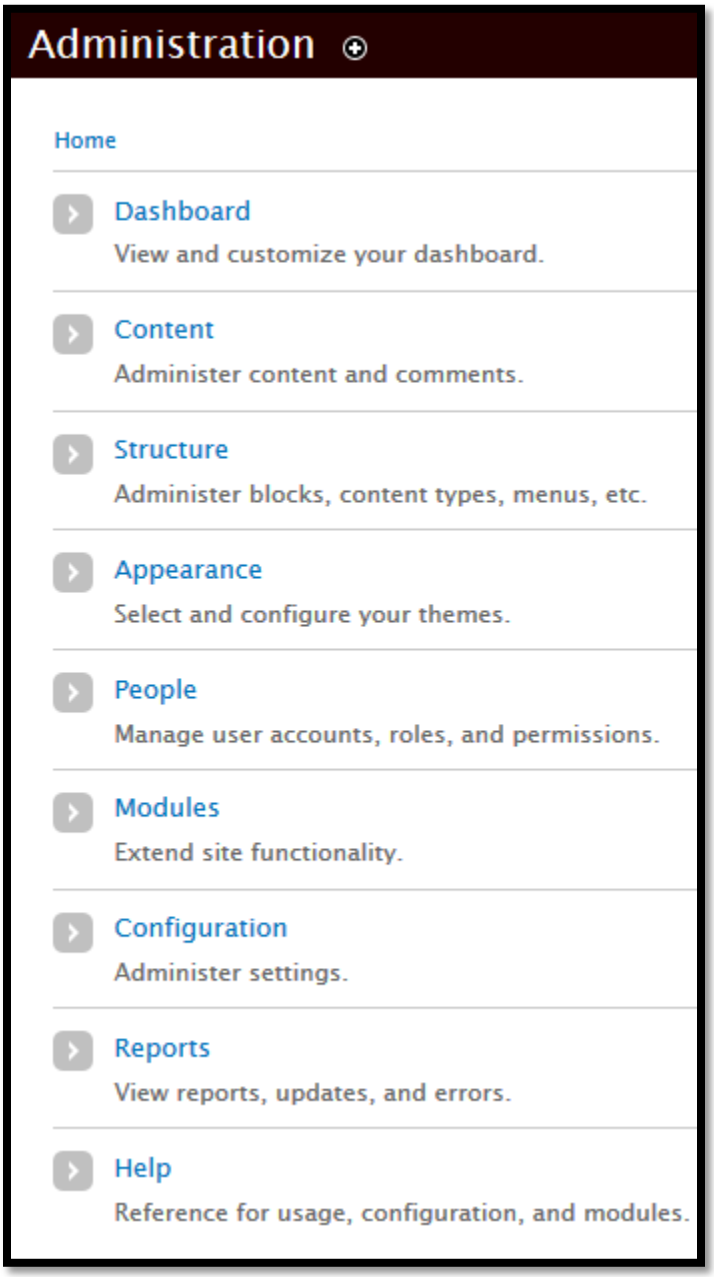


Figure 52: Select Administration>People

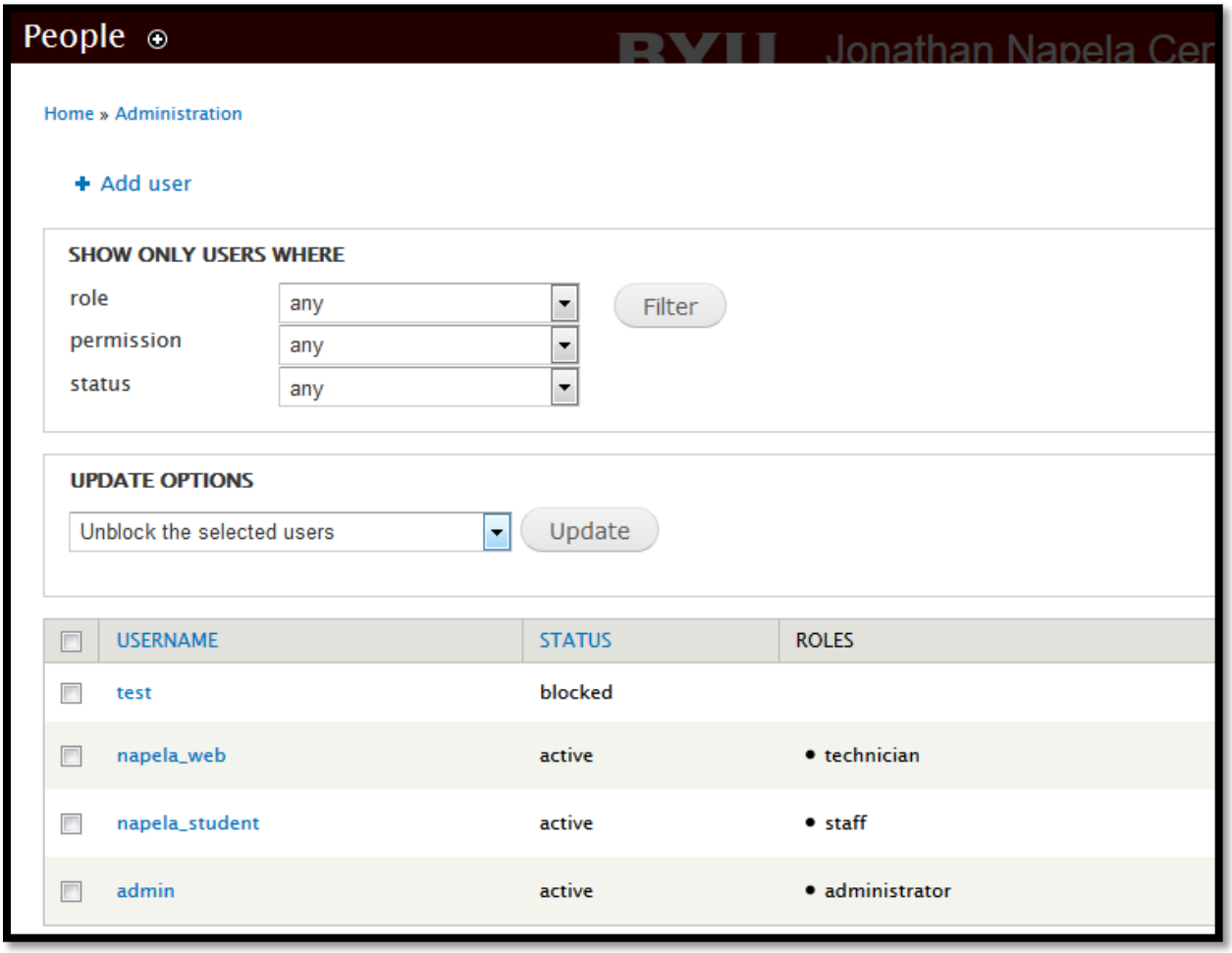


Figure 53: Select Add user.

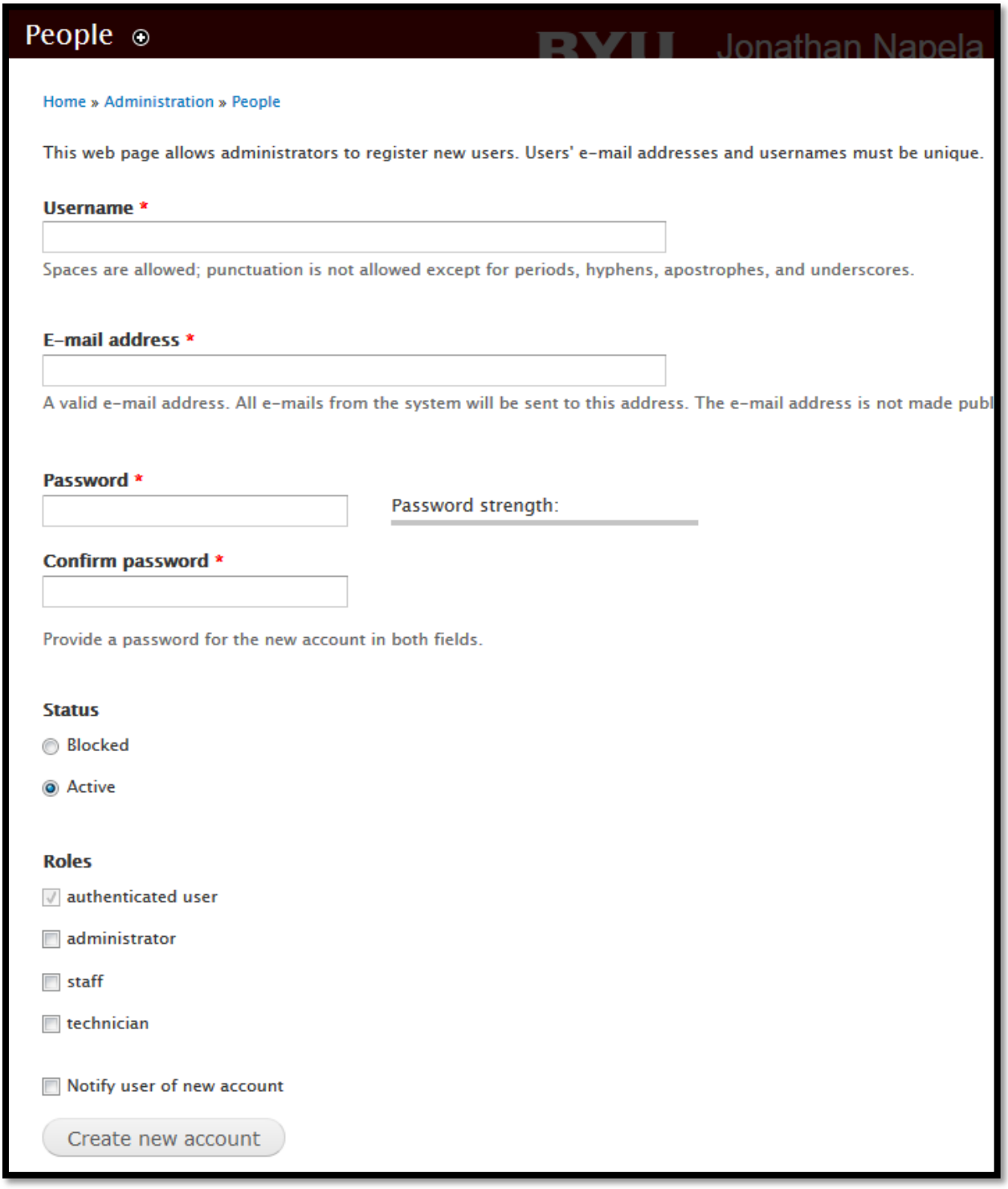


Figure 54: Fill out the information and select the type of Roles that will be assigned to the user.

Creating Taxonomy

To create a new Taxonomy you have to go to Structure>Taxonomy. In there you can “Add vocabulary” or edit existing vocabulary.

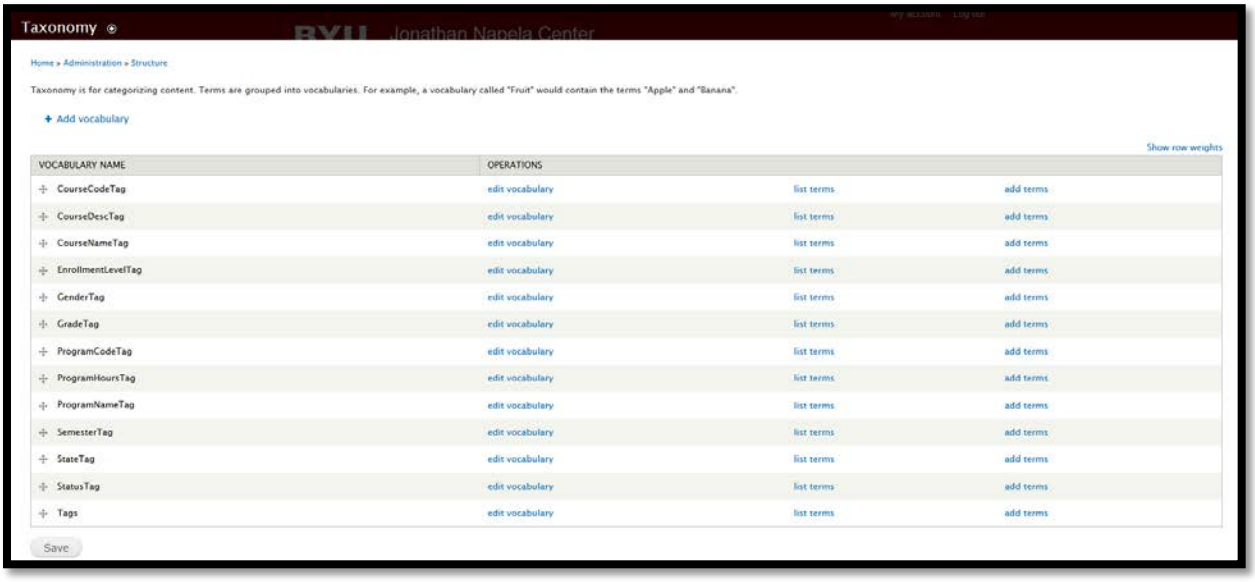


Figure 56: Creating Taxonomy

Backup and Migrate

It is important to back up the database every so often. To do this you can go to Administration>Configuration>Backup and Migrate.

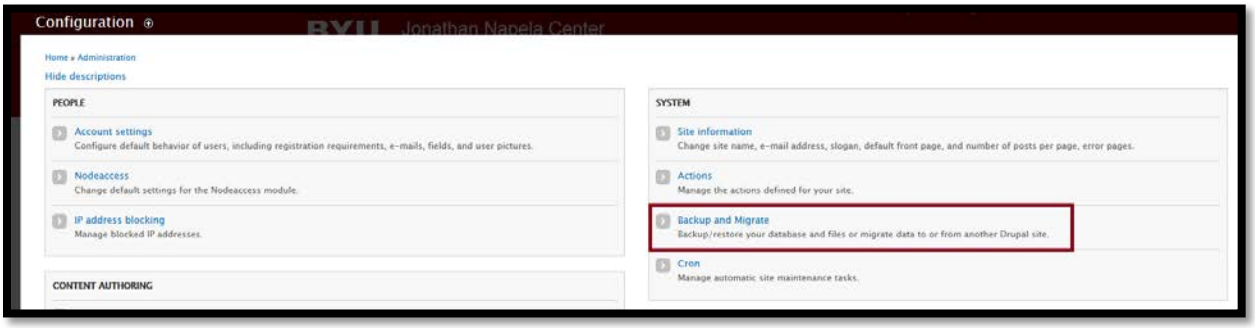


Figure 57: Backup and Migrate

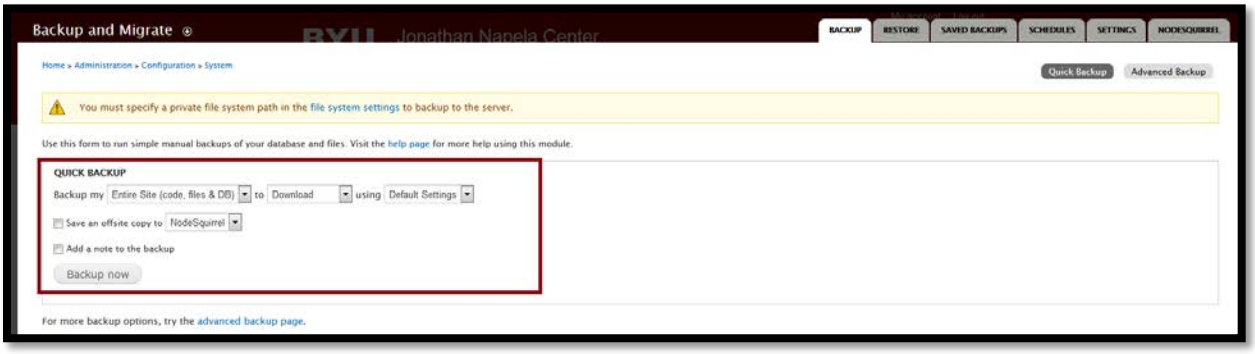


Figure 58: Quick Backup but you also have a choice to do just the DB or the entire Site.

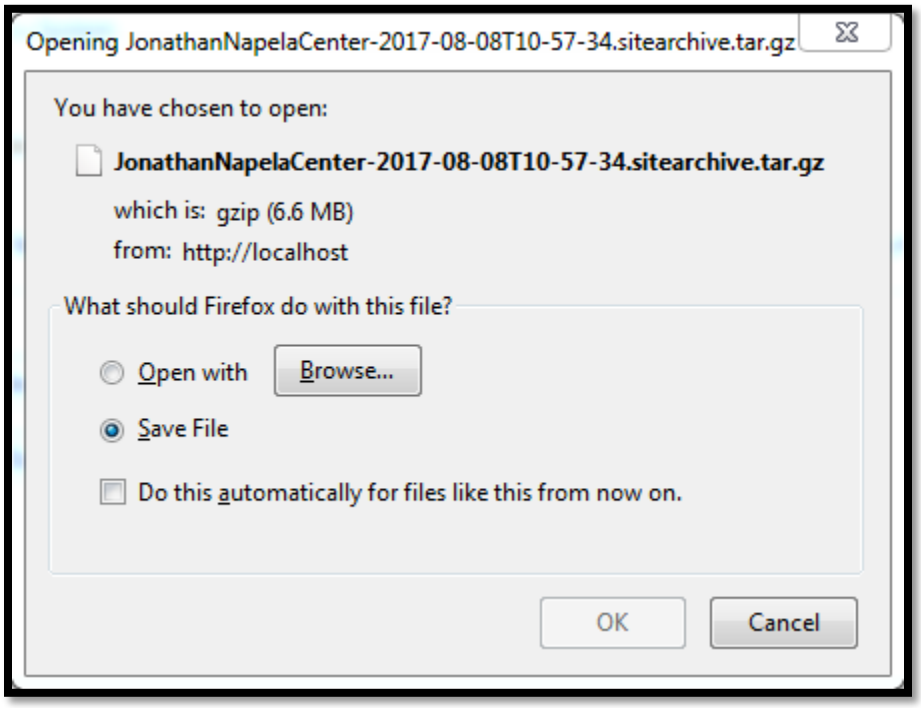


Figure 59: Prompt you to save file.