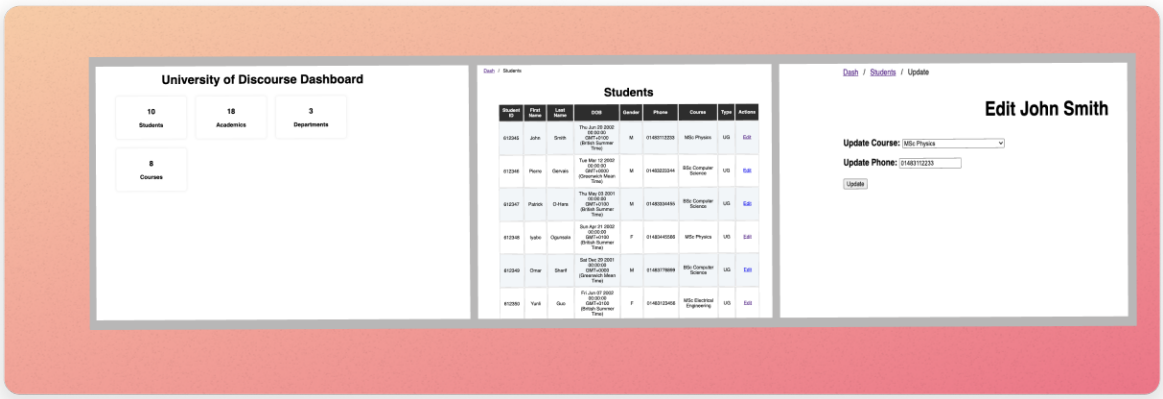
Contents

Lab 10: Creating a Full Stack Application



> This is what we are making in this lab!

In this lab, you'll combine everything you've learned so far.

In doing so, you are going to make a full-stack web application. By the end of this session, you'll add a web front-end to our university of discourse database. You'll be able to display a list of students and update the course they are on.

An important point You should note, most of you won't finish this lab in the session. That's ok. You'll have plenty of time to finish the application in your own time.

Following this lab, I'll release a video that will walk you through the solution.

If you get stuck, don't forget to ask for help.

Dependencies

Ensure the Node Environment path is set on your VM, and you have installed VS code (see, the week 8 lab, "exercise 0.1 : Leveling up our Development Environment".

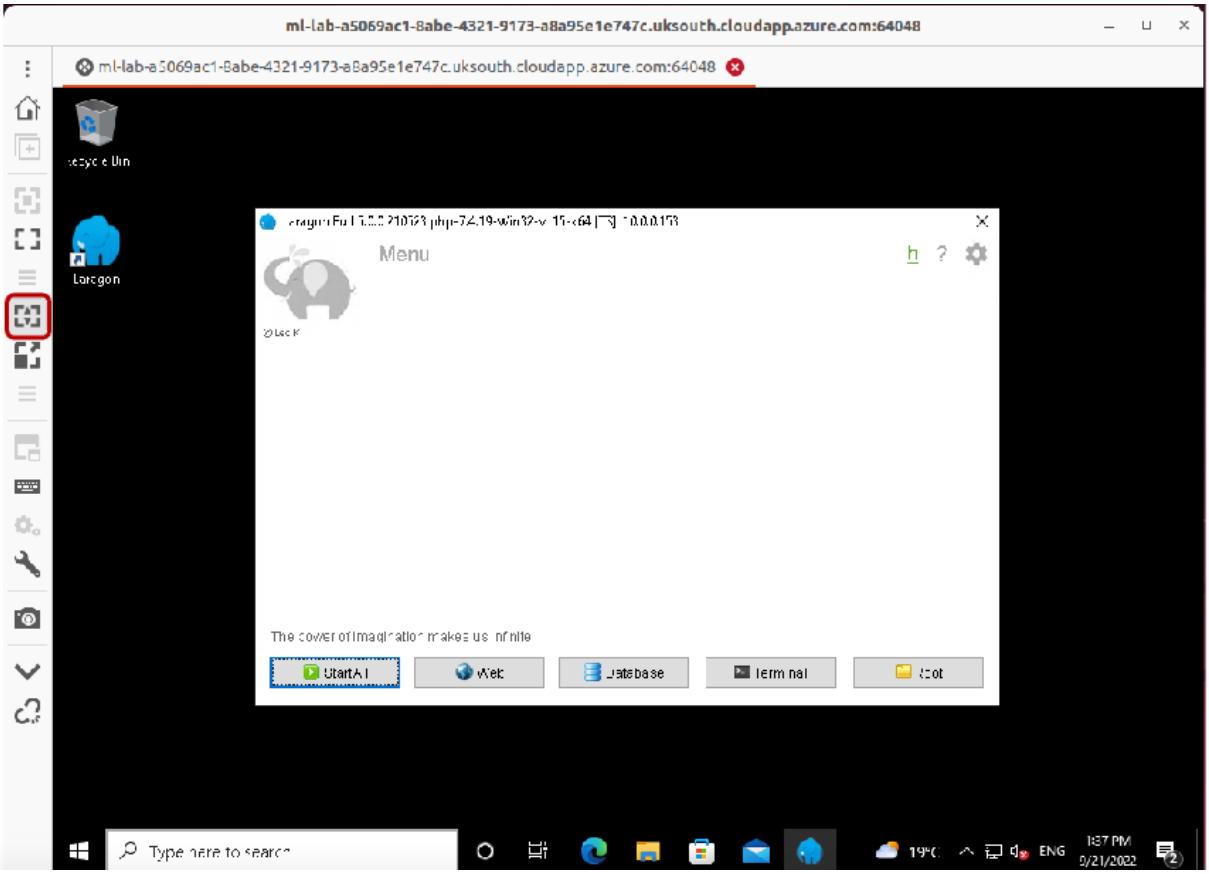
If you are working along from home, you won't need to set the path; however, you will need to install VSCode (see, https://code.visualstudio.com/download) and NodeJS (see, https://nodejs.org/en). Further, you will need to install mysql (see, https://dev.mysql.com/downloads/installer/). Finally, ensure you have git installed (see, https://git-scm.com/downloads).

0.0 Getting Started

In this part of the lab, we'll get set up and get the starter code.

Exercise 0.1 : Getting Started

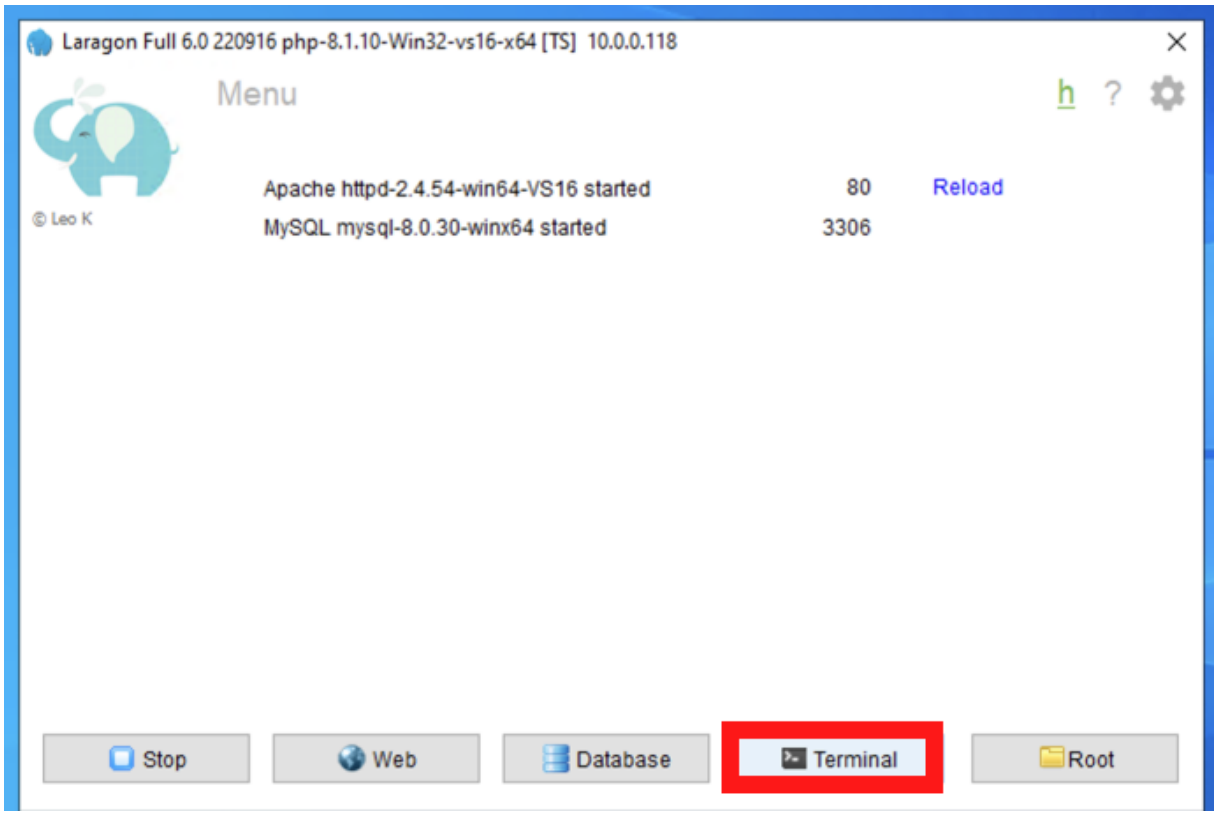
1. As always, start and connect to your Azure Labs' virtual machine (VM) by visiting this link: https://labs.azure.com/virtualmachines.
2. Connect to the VM:
    1. Toggle the button to start – it might take a while.
    2. Once it changes to Running, click on the monitor icon.
    3. A file will be downloaded – click on it to run it, and you will be prompted to enter the password you created last time. IMPORTANT: the username must be `labuser` (remove the ~/).
    4. Remember to click on the following icon to make the window resize appropriately
3. Within your VM, create a folder in your `C:\code` directory called `lab_10`.



4. Open Laragon and start all services.
5. Open VS Code and open the `lab_10` folder.

Exercise 0.2: Getting the starter code

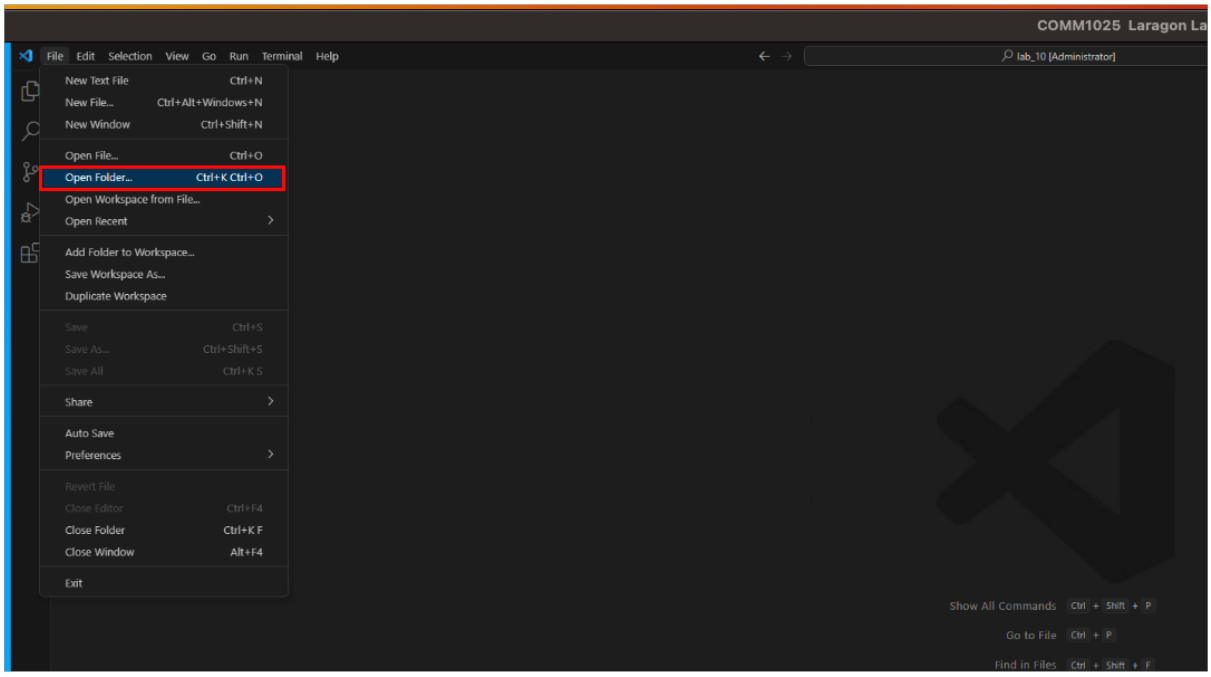
This week, I've provided you with some starter code. We'll use git to get this code. Git is installed with Laragon, so we can use the Laragon terminal to get the code.



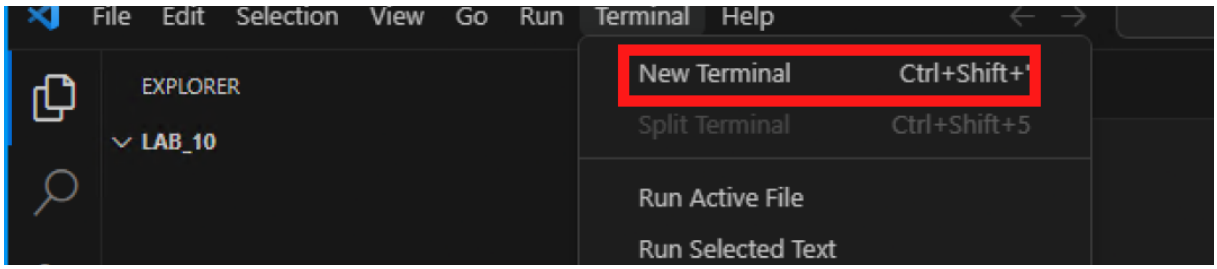
1. Within your VM, open the Laragon terminal.
2. Navigate to the `lab_10` folder you created earlier: `cd C:\code\lab_10`, and run the following command (**don't forget the `.` at the end, this tells git to clone the code into the current directory**):

   ```
   git clone https://github.com/joeappleton18/w-d-l-10.git .
   ```

> This will clone the starter code into your lab_10 folder.



3. Open the `lab_10` folder in VS Code.



4. We are now ready to install our dependencies. Remember, we are using the package manager npm to install manage dependencies listed in **`package.json`** file (you can find this file in the root of your `lab_10` folder), take a look in this folder. We'll use the VS Code terminal to do this. Open the VS Code terminal and run the following command:

```
npm install
```

> ensure you are in the `lab_10` folder when you run this command. Some of you may be in the parent folder; if you did not correctly clone the git repository, you may have a folder called `w-d-l-10` in your `lab_10` folder. If this is the case, you'll need to run the following command: `cd w-d-l-10` and then run `npm install`.

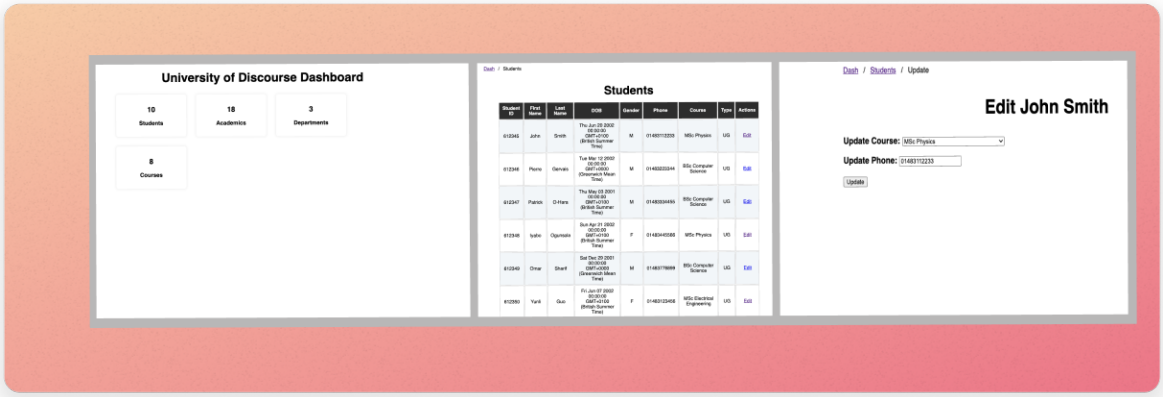
The above command installs the dependencies listed in the **`package.json`** file, and places them in the `node_modules` folder (it may take a little bit of time). For now, we have pulled in just three

dependencies:

- `express`: A web framework for NodeJS.
- `ejs`: A templating engine for NodeJS.
- `nodemon`: A tool that will automatically restart our server when we make changes to our code.

5. We are now ready to run our application. If you check the **`package.json`** file, you'll I've created a start script: `"start": "nodemon index.js",`. To run this script, in the terminal, execute the command: `npm run start`. This will start our server. You should see the following output:

```
Example app listening at http://localhost:8000
```



6. Open a browser in your VM and navigate to `http://localhost:8000`.

You should see our University of Discord web application. Currently, all of the values are hard-coded. We'll fix this in the next exercises.

0.3 Setting up the database

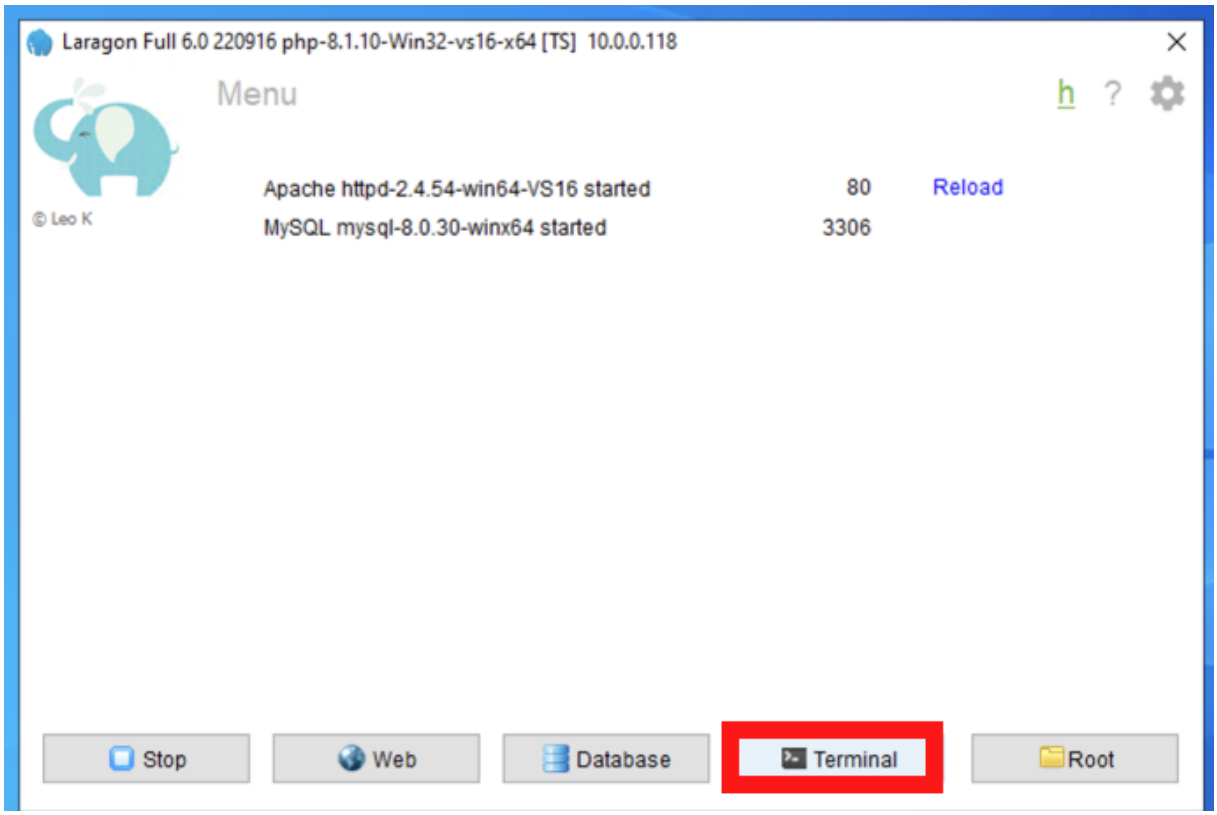


Figure 1: terminal

Let's set up the database we'll use for this lab.

1. Open the Laragon terminal. While you are there, ensure all services are running!
2. In the Laragon terminal load the database by running the following commands (ensure, if you copy and past the commands, there are no spaces - it's a good idea to type them out):
    1. Navigate the the MySQL bin folder:
        - `cd C:\laragon\bin\mysql\mysql-8.0.30-winx64\bin`
    2. Run the command below to run the database script:
        - `mysql -u root -p < C:\code\lab_10\seeds\university.sql`
    3. You'll be prompted for a password, just press enter.
    4. To check the database has been created:
        1. From the terminal run: `mysql -u root -p`
        2. Again, you'll be prompted for a password, just press enter.

3. You should now be in the MySQL shell. Run the following command to see the databases: `show databases;`
4. You should see the `university_web` database listed. This is the database you created by running university.sql.

5. Take a look at some of the tables: `use university_web;` then `show tables;` then `select * from Student;`

Phew! That was a lot of setup. But now we are ready to start adding some dynamic functionality.

1.0 Adding a database connection

In this section, we'll connect to our `university_web` database, this is a fairly simple process.

We'll then use this connection to inject data into our, currently hard-coded, EJS views.

Exercise 1.0: Adding a database connection

1. First, we need to install the Node.js, `mysql` package. This will allow us to connect to our database, and run queries. To do this, we'll use the VS Code terminal.

2. As your application is currently running in the terminal, create a new terminal tab in VS Code by clicking the + icon in the terminal pane.
3. In the VS code terminal, run the following command:

```
npm install mysql
```

If all has gone well, you should see mysql listed in the **`package.json`** file. This means we have successfully installed the package.

4. Switch back to the terminal tab running your program. You'll need to check this regularly to see if you have any errors (hopefully you won't have any at the moment)
5. Now we need to add the code to connect to our database. Open the `index.js` file. At the top of the file, add the following code to import two dependencies:

```
/**
 * Import the mysql package installed in the previous step.
 */
const mysql = require("mysql");

/**
 * Import the util package. We use this to use async await with mysql.
 * Don't worry about this for now, just understand that we need it
 */
const util = require("util");
```

3. Now we need to create a connection to our database, but where do we add this?

You will see at the towards the top of your `index.js` file, there are some constants defined:

```
const PORT = 8000;
const DB_HOST = "localhost";
const DB_USER = "root";
const DB_NAME = "university_web";
const DB_PASSWORD = "";
const DB_PORT = 3306;
```

The constants above are used to store database connection information. We can use these constants to create a connection to our database. Add the following code below the const declarations:

```
/**
 * set the connection parameters
 */
var connection = mysql.createConnection({
  host: DB_HOST,
  user: DB_USER,
  password: DB_PASSWORD,
  database: DB_NAME,
  port: DB_PORT,
});

/*
 * we do this to use async await with mysql
 * don't worry about this for now, just understand that we need it;
    otherwise * we end up with a lot of callback functions.
 */
connection.query = util.promisify(connection.query).bind(connection);

/**
 * connect to the database.
 * If you see an error, check the database name, username, and password
    are correct. This probably because you are using your own MySql
    instance.
 */
connection.connect(function (err) {
  if (err) {
    console.error("error connecting: " + err.stack);
    return;
  }
  console.log("Booom! You are connected");
});
```

> Connecting to the database.

```
[nodemon] restarting due to changes...
[nodemon] starting `node index.js`
Example app listening at http://localhost:8000
Booom! You are connected
```

If all has worked correctly, you should see the following message in the terminal: `Booom! You are connected`.

If you see an error, check the database name, username, and password are correct. Also, check you've run the database script (covered above), we need the university_web database to be created before we can connect.

If you are still having problems, ask for help.

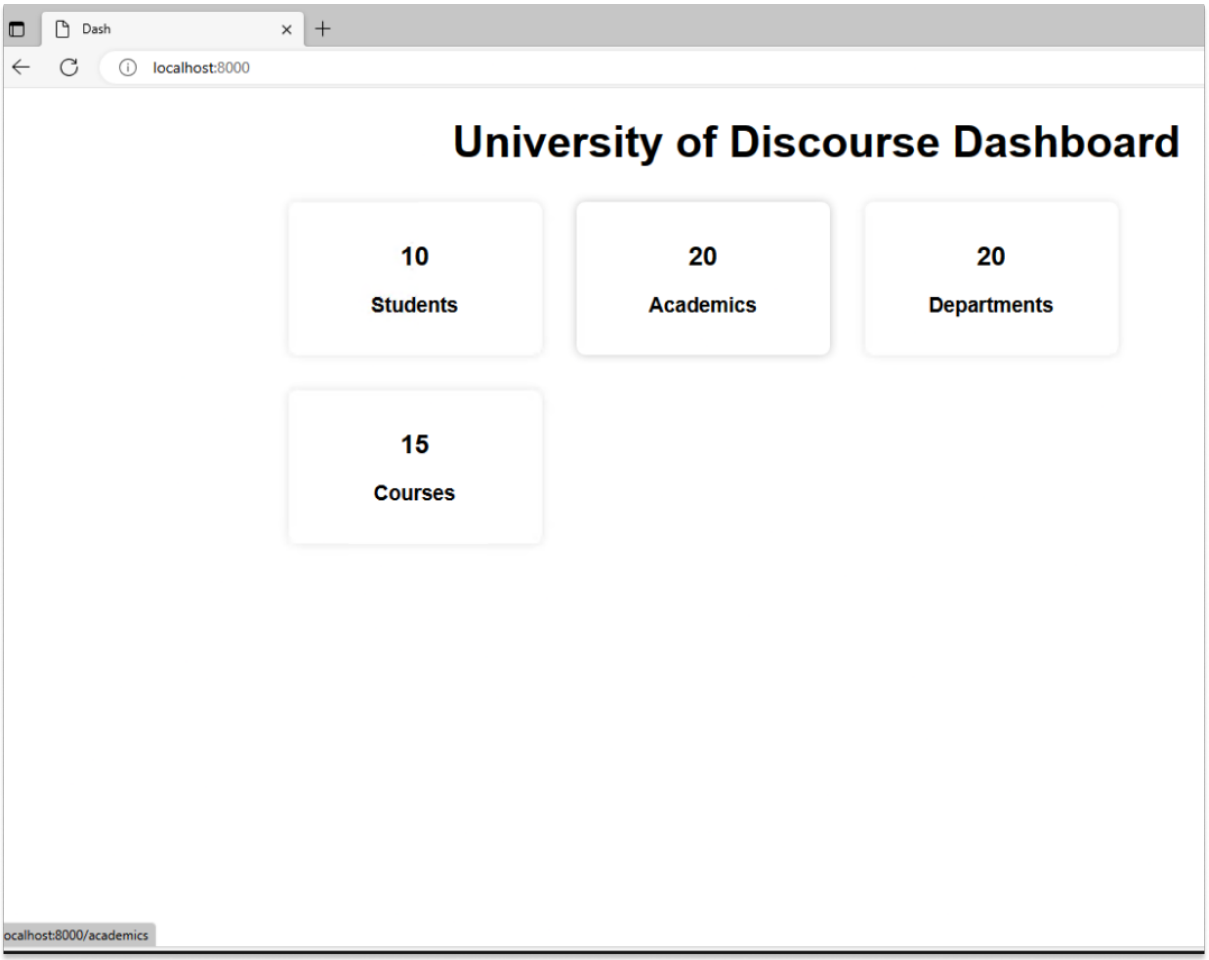
Click here to see the solutions

2.0 Injecting data into our views

In this section, we'll learn how to inject data into our EJS views. We'll start by considering our home page.

Exercise 2.0: Injecting data into the home view

1. Navigate to `http://localhost:8000` in your browser. You should see the following page:



If you recall from last week, we use express to create routes. These routes are responsible for handling requests from the browser. In the `index.js` file, you should see the following code:

```
app.get("/", async (req, res) => {
  res.render("index", {
    studentCount: 10,
    academicCount: 20,
    departmentCount: 20,
    courseCount: 15,
  });
});
```

You should be familiar with the `app.get` syntax, and how we are using it to render the view `index.ejs`. You can find this view in the `views` folder.However, notice how we are injecting data into the view. This is done by passing an object as the second parameter of the `render` function. Fore more information about objects see here.

Within EJS templates, we can access the values injected into our view by using the following syntax: `<%= studentCount %>`. The `<%=` and `%>` are special tags that tell EJS to inject the value of the variable into the view. To see this in action, open `views/index.ejs` and take a look at the code. You should see the following:

```
<div class="row">
  <div class="col-3">
    <div class="card">
      <div class="card-body">
        <h5 class="card-title">Students</h5>
        <p class="card-text"><%= studentCount %></p>
        <a href="/students" class="btn btn-primary">View</a>
      </div>
    </div>
  </div>
</div>
```

Now we know how to inject data into our views, we can start to make our application dynamic. Let's consider our university_web database. We have a number of tables:

```
+--------------------------+
| Tables_in_university_web |
+--------------------------+
| Academic                 |
| Course                   |
| Department               |
| Postgraduate             |
| Student                  |
| Student_Email            |
| Undergraduate            |
+--------------------------+
```

Using a standard SQL query, we can get the number of rows in a table. For example, to get the number of students, we can run the following query:

```
SELECT COUNT(*) FROM Student; // this will return the number of rows in
    the Student table.
```

Since we are using the mysql package, we can run this query in our code, and save it to a constant like this:

```
const studentCount = await connection.query(
  "SELECT COUNT(*) as count FROM Student"
);
```

The above code runs the query `"SELECT COUNT(*)as count FROM Student"` and stores the result in a constant called `studentCount`. Notice how we use the `await` keyword. This is because the `connection.query` function is asynchronous. `studentCount` will be an array of objects. In this case, it will be an array with one object:

```
[
  {
    count: 10,
  },
];
```

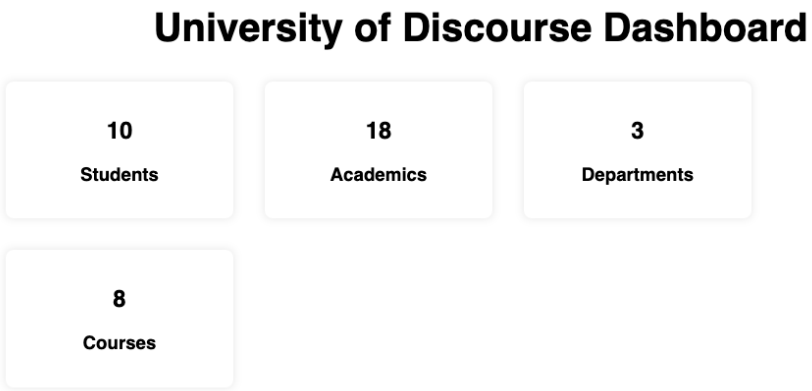
We access the count value by using the following syntax: `studentCount[0].count`. The `[0]` is used to access the first element in the array. The `.count` is used to access the count property of the object. Putting this all together, we can update our `index.js` file to inject the number of students into our view:

```
...
app.get('/', async (req, res) => {
   // add this line
   const studentCount = await connection.query('SELECT COUNT(*) as count
      FROM Student');
    res.render('index', {
        studentCount: studentCount[0].count, // <--- update here
        academicCount: 20,
        departmentCount: 20,
        courseCount: 15
    });
});
...
```

> index.js

3. To finish this task, use the guidance above to replace hard coded values (`studentCount`, `academicCount`, `departmentCount`, and `courseCount`) with the output of SQL queries. You should store the output of the queries in constants. Then use the constants to inject the values into the view, like we did with `studentCount` above.

When done, your homepage should look like this:

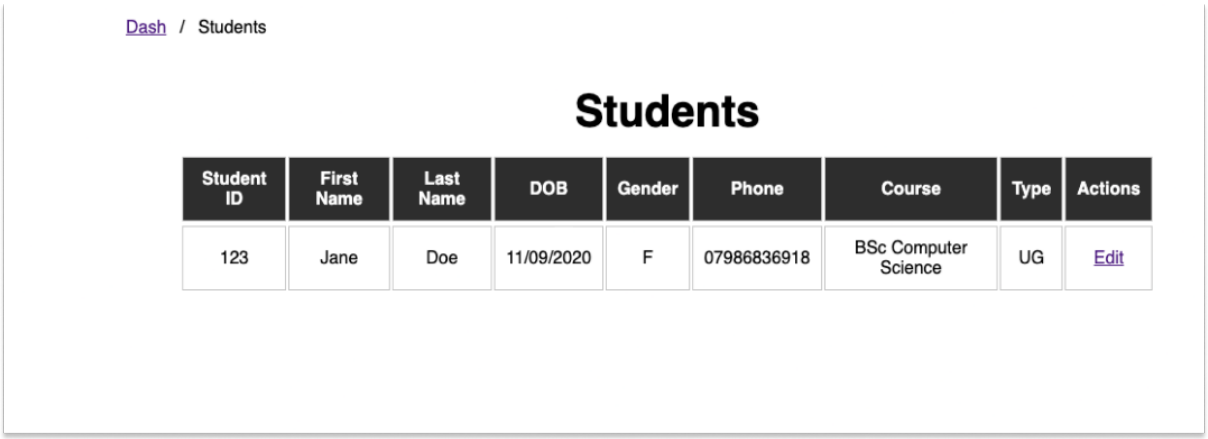


Click here to see the solutions

3.0 Working with more complex data

So far, we have only injected simple, single object into our home view. However, we can also inject more complex data. For example, we can inject an array of objects.

Let's consider the /`students` route. You can fire this route by visiting `http://localhost:8000/students` in your VMs browser. You should see the following page:



Currently, there is no dynamic data on these pages. Take a look at `views/students.ejs`. You should see a bog standard html table. Let's see if we can make this view dynamic.

Exercise 3.0: Dynamic multiple values

1. Open the `index.js` file. You should see the following code:

```
app.get("/students", async (req, res) => {
  res.render("students", { students: [] });
});
```

Above, we are rendering the `students` view and injecting an empty array into the view. We can access this array in the view by using the following syntax: `<%= students[0] %>` (this will grab our first student). Let's see if we can inject some data into this array. Update your code so instead of an empty array we are injecting database values:

```
app.get("/students", async (req, res) => {
  /**
   * get all students from the database. we use an inner join to get the
      course name. don't display the course code, display the course name!
   */
  const students = await connection.query(
    "SELECT * FROM Student INNER JOIN Course  ON student.Stu_Course =
       course.Crs_Code"
  );
  res.render("students", { students: students });
});
```

> due to presenting the above code on a PDF, the select statement is split over two lines. In your code, it should be on one line.

Notice how we use an inner join. This is because we want to get the course name. If we did not have this we would just have to display the course code (this would not mean much to an end user).

Now we have injected the data into the view, we need to display it. Open the `views/students.ejs` file. The great thing about EJS is that we can use JavaScript in our views. This means we can use loops to iterate over our array. This is a standard JavaScript technique (see here for more information).

For example we can use the following code to iterate over our students array and out output a table row for each student:

```
<% students.forEach(student=> { %>
<tr>
  <td><%- student.URN %></td>
  <td><%- student.Stu_FName %></td>
  <td><%- student.Stu_LName %></td>
  <td><%- student.Stu_DOB %></td>
  <td><%- student.Stu_Gender %></td>
  <td><%- student.Stu_Phone %></td>
  <td><%- student.Crs_Title %></td>
  <td><%- student.Stu_Type %></td>
  <td>
    <a href="/students/edit/<%- student.URN %>"> Edit </a>
    <a href="/students/view/<%- student.URN %>"> View </a>
  </td>
</tr>
<% }) %>
```

Notice how we use the `<% %>` tags to tell EJS that we are using JavaScript. We then use the `forEach` function to iterate over the students array. For each student, we output a table row. Further, we create a unique link to the edit and view pages (`<a href="/students/edit/<%- student.URN %>"> Edit </a> </td>`) for for each student. We'll create this pages in the next exercise.

1. To complete this exercise, see if you can update `views/students.ejs` to dynamically display our students from the database. You will need to use the examples above to update `index.js` and `views/students.ejs`. Once you've done this, you should see a list of students on the students page.

Click here to see the solutions

If you've made it to this point, well done! You've learned a lot. You've learned how to connect to a database, run queries, and inject data into views. You've also learned how to use loops to iterate over data. In the next section, we'll learn how to update data.

3.1 Dynamic Single Table Rows

In the previous section, we learned how to inject data into a view. We also learned how to use loops to iterate over data. In this part of the lab, we'll learn how to use a similar technique to display a single row from a table.

Recall, we created a unique view and edit link for each student in our students table (http://localhost:8000/students). Let's consider the view link, we coded it like this:

```
<a href="/students/view/<%- student.URN %>"> View </a>
```

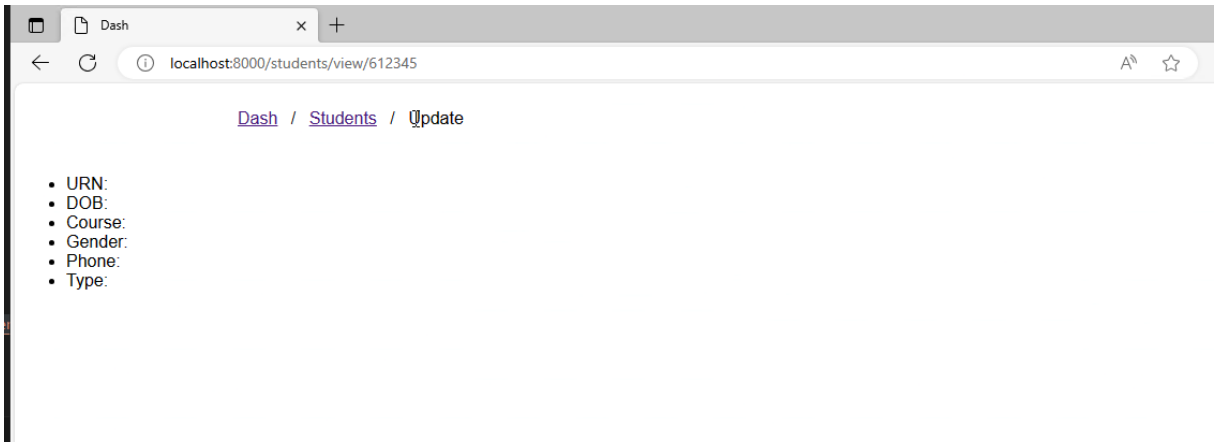
When rendered and sent to the browser, the browser will see something like this:

```
<a href="/students/view/612345"> View </a>
```

There are a couple of things to note here:

- The `/students/view/` part of the URL is the route we want to fire.
- The `612345` part of the URL is the student's URN. This is the unique identifier for the student. We can use this to get the student from the database.

If you click on a view link in http://localhost:8000/students you'll see the following page:



Let's consider how we can access the URN to get the student from the database and complete the view. In `index.js`, consider the route

```
app.get("/students/edit/:id", async (req, res) => {
  res.render("student_edit", { student: {}, courses: [], message: "" });
});
```

Above notice the `:id` part of the route. This tells Express that we want to use a parameterised route. In this case, it will contain the student's URN. We can access the URN by using the following syntax: `req.params.id`. This means to get the student from the database, we can use the following code:

```
app.get("/students/view/:id", async (req, res) => {
  const student = await connection.query(
    "SELECT * FROM Student INNER JOIN Course  ON student.Stu_Course =
       course.Crs_Code WHERE URN = ?",
    [req.params.id]
  );
  res.render("student_view", { student: student[0] });
});
```

Above, we use the `req.params.id` to get the URN from the URL. We then pass the value of the URN parameter as the second parameter of the `query` function. We then inject the student object into the view. We can then access the student object in the view, as normal by using the following syntax:

`<%= student.<FieldName> %>`.

Exercise 3.1 Dynamic Single Table Rows

1. Use the above examples to update `index.js`'s `'/students/view/:id'` route to inject the a student object into the view. When done, if you visit `http://localhost:8000/students/view/612345` you should see John Smith's record.

Take a look at `views/student_view.ejs`. You should and see how we are using the student object to display the student's details. For example, we use the following code to display the student's name:

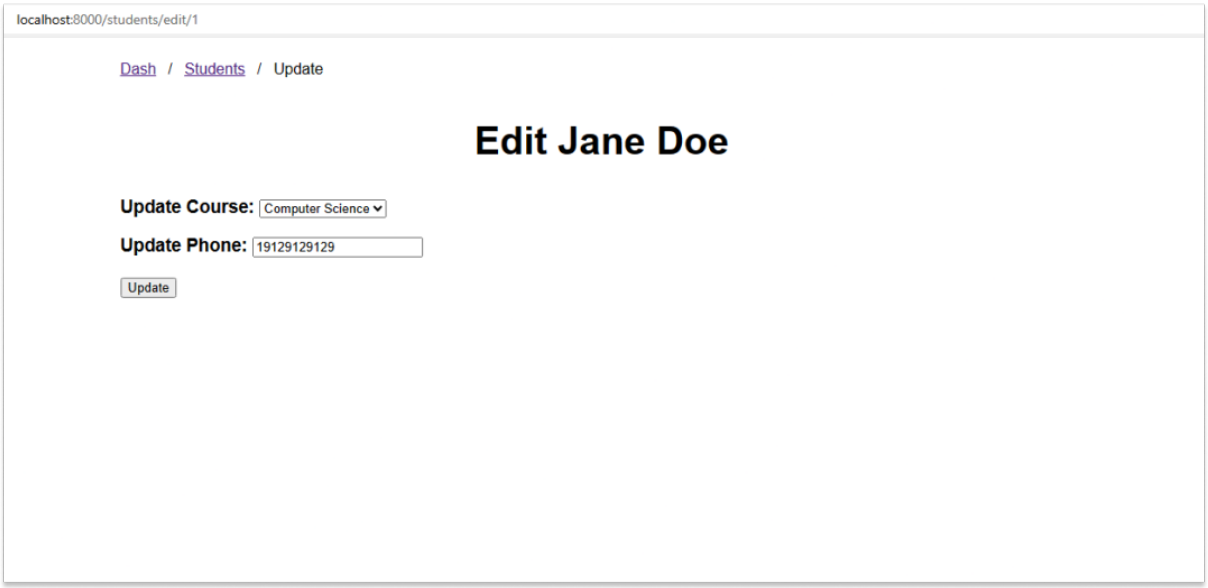
```
<h1><%- student.Stu_FName %> <%- student.Stu_LName %></h1>
```

Click here to see the solutions

At this point, you may want to take a break, and complete the next section in your own time. By the end of week 10, I'll release a video that will walk you through the solution. Further to this, the first hour of week-11 will be dedicated to supporting you in completing the final task

4.0 Updating data

So far, we have only displayed data. However, we can also update data. Let's consider the `/students/edit` route. You can fire this route by visiting `http://localhost:8000/students/edit/1` in your VM's web browser. You should see the following page:



You've probably guessed, the values in this page are hard coded. Let's see if we can make this view dynamic. The first thing we need to consider is how we are going to get the data for the student we want to edit.

We can use the same technique we used in the previous section, to dynamically display a single row from a table.

In `index.js` we can do something like this to our `'/students/edit/:id'` route:

```
app.get("/students/edit/:id", async (req, res) => {
  const student = await connection.query(
    "SELECT * FROM Student WHERE URN = ?",
    [req.params.id]
  );
  res.render("student_edit", {
    student: student[0],
    courses: [],
    message: "",
  });
});
```

Exercise 4.0: Accessing URL parameters

1. Use the above examples to update `index.js`'s `'/students/edit/:id'` route to inject the a student object into the view.
2. To test your above update has worked. Navigate to `localhost:8000/students` and click edit on one of the student records. Next, update `views/student_edit.ejs` and replace "Jane Doe" with `<h1> Edit <%- student.Stu_FName %> <%- student.Stu_LName %> </h1>` and refresh the page. You should see the student's name appear on the page.

Click here to see the solutions

4.1 Injecting values into a form

So far, we have been managing HTTP GET requests. To this point, the communication has consisted of sending the data back to the browser (otherwise known as the client); however, to complete our application, we must enable the client to send user controlled data to the server.

The most common way for users to send data is through HTML forms - you probably already know this. Let's consider how we can update `views/student_edit.ejs` and `index.js` to process a form update.

Exercise 4.1: Injecting values into a form

1. First, in your VM's browser to navigate to the route: "http://localhost:8000/students/edit/612345"; you should see John Smith's record.

Currently, the form has hard coded data! Let's consider how we can update this. In VS code, open `views/student_edit.ejs`.

2. Navigate to the `<form>` element there are two things we need to consider:
    1. The first is the `method` attribute in the form tag: `<form method="post"class="edit_form">` in this instance it is post. This tells the browser that we want to send a POST request to the server. We could add an optional, `action` attribute to the form tag. This tells the browser where to send the request. If we don't specify an action, the browser will send the request to the current route. In this case, it will send the request to the current url (e.g., `/students/edit/612345`,).
    2. The second is how we embed values into the form. Consider the following: `<input type="tel"value="19129129129"name="Stu_Phone"required>`. There are some important things to note here:
        - The `value` attribute is used to set the value of the input. In this case, we are hard coding the value.
        - The `name` attribute is used to give the input a name. The name should match the name of the field in the database. In this case, we are using the `Stu_Phone` field.
        - The `required` attribute is used to tell the browser that the input is required. If the user tries to submit the form without filling in the input, the browser will display an error message.

3. Use the `<%= %>` syntax to inject a value from our view. For example, we could use the following code: `<input type="tel"value="<%= student.Stu_Phone %>"name="Stu_Phone"required>`. This would inject the student's phone number into the input.

Ok, so we've managed to inject the student's phone number into the form; however, we now need to consider the course they are taking, this is a little more tricky. You'll notice the course the student is taking is a foreign key (e.g, 211). This key relates to the course code in the course table.

Since we don't want to just display a course number to the user, we need to get the pass a list of courses into our edit view.

If you open `index.js`, you'll notice we are currently just passing in a blank courses array (`[]`) to the view.

```
app.get("/students/edit/:id", async (req, res) => {
  const student = await connection.query(
    "SELECT * FROM Student WHERE URN = ?",
    [req.params.id]
  );
  res.render("student_edit", { student: student[0], courses: [], message:
     "" });
});
```

4. Update the above section to pass in the courses. You'll need to use a SQL query to get the courses. You can use the following query as a starting point: `const courses = await connection.query('SELECT * FROM Course');`.

Now we have the courses in the view, we need to display them in the form. To do this we need to construct a loop to iterate over the courses array. For each course, we need to create an option tag, we also need to ensure the students current course is selected, we could use the following code:

```
<select class="form-control" name="Stu_Course" id="course" required>
<% courses.forEach( course=> { %>
                              <option value="<%= course.Crs_Code %>"
                                  <%=course.Crs_Code===student.Stu_Course ?
                                     'selected'
                                  : "" %>>

                                  <%= course.Crs_Title %>
                              </option>
<% }) %>
```

Notice how we use the `<%= %>` syntax to inject the course code and course title into the option tag. We also use a ternary operator (`<%=course.Crs_Code===student.Stu_Course ? 'selected' : ""%>`) to check if the course code matches the student's course code. If it does, we add the `selected` attribute to the option tag. This tells the browser to select the option.

5. Update the `views/student_edit.ejs` file to display the courses in the form. Once you've done this, the correct course should be selected when you visit the edit page for any student. **Note,** make sure you remove the currently hard coded courses.

Click here to see the solutions

4.2: Processing a Post request

We are nearly there! We can now display the data in the form. The final step is to process the form when the user submits it.

Exercise 4.2: Processing a Post request

1. First, we need to add a route to handle the post request. Open the `index.js` file and add the following code:

```
app.post("/students/edit/:id", async (req, res) => {
  console.log(req);
});
```

> index.js

2. Use the above example to update `index.js` to handle a post request from the form.
3. Submit the form (press the update button on the update page), and check the terminal. You'll see a long list of values; however, no `Stu_Phone` or `Stu_Course`! This is because we need to tell Express to parse are form values and attache them the HTTP request. To do this we first need to install the `body-parser` middleware package.
4. In the terminal, run the following command:

```
npm install body-parser
```

5. Next, we need to tell Express to use the body-parser package. Open the `index.js` file and add the following code:

```
// at the top of the file
const bodyParser = require('body-parser');

...
// below the other use statements
app.use(bodyParser.urlencoded({ extended: false }));
```

> index.js

6. Now update your `post` route to print out the request body, and you should see the form values in the terminal when you submit the form:

```
app.post("/students/edit/:id", async (req, res) => {
  console.log(req.body);
});
```

Click here to see the solutions

Exercise 4.3: Updating the database

We are now ready to update the database with the form values. The flow will look something like this:

1. The browser sends a POST request to the server.
2. The server parses the body of the request and gets the form values.
3. The server updates the database.
4. The server re-renders the edit page with the updated student.

Let's get going!

We can update the database, and re-render the edit view, by using the following code:

```
app.post("/students/edit/:id", async (req, res) => {
  await connection.query("UPDATE Student SET ? WHERE URN = ?", [
    req.body,
    req.params.id,
  ]);
  const student = await connection.query(
    "SELECT * FROM Student WHERE URN = ?",
    [req.params.id]
  );
  const courses = await connection.query("SELECT * FROM Course");
  res.render("student_edit", {
    student: student[0],
    courses: courses,
    message: "student updated",
  });
});
```

> index.js

Above we are using the ? syntax to tell MySQL that we want to use a parameterised query. We then pass the value of the URN parameter (`req.params.id`) as the second parameter of the `query` function. Next, we gather the updated student and list of courses to populate our view. Finally, we re-render the view with a message to tell the user the student has been updated.

1. Use the code above to add the update functionality to your application. Once you've done this, you should be able to update the student's details and see the updated details on the edit page.
2. Finally, let's add some basic validation. We've already done this client side by adding the `required` attribute to the form inputs. However, it's normally a good idea to add some server-side validation. Let's consider how we might do this:

```
app.post("/students/edit/:id", async (req, res) => {
  var message = "";

  if (isNaN(req.body.Stu_Phone) || req.body.Stu_Phone.length != 11) {
    message = "Please enter a valid phone number";
  } else {
    await connection.query("UPDATE Student SET ? WHERE URN = ?", [
      req.body,
      req.params.id,
    ]);
    message = "Student updated";
  }
  const student = await connection.query(
    "SELECT * FROM Student WHERE URN = ?",
    [req.params.id]
  );
  const courses = await connection.query("SELECT * FROM Course");
  res.render("student_edit", {
    student: student[0],
    courses: courses,
    message: message,
  });
});
```

> index.js

Above, we are using the `isNaN` function to check if the phone number is a number. We are also checking the length of the phone number. If the phone number is not a number, or the length is not 11, we set the message to "Please enter a valid phone number". Notice how we are using the `||` if either of the conditions hold.

3. To finish the lab, add the above code to your application. Once you've done this, try updating a student's phone number to a non-number. You should see the message "Please enter a valid phone number" appear on the edit page.

Click here to see the solutions

Stretch Tasks

1. Add the functionality to view a single student. This is similar to the edit route.
2. Add the ability to add a new student to the database. You'll need to create a new route, and a new view. You'll also need to add a link to the new student page on the students page. You can use the edit page as a starting point.

3. Can you add delete functionality to the application? In the case of a student, this would mean adding a delete link next to the existing edit link. When the user clicks the delete link, the student should be deleted from the database.