IF330 Pemrograman Web.

06 –PHP & MySQL

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PROGRAM STUDI INFORMATIKA
FAKULTAS TEKNIK DAN INFORMATIKA
UNIVERSITAS MULTIMEDIA NUSANTARA
SEMESTER GANJIL TAHUN AJARAN 2022/2023

REVIEW

- File Upload
- Generate PDF
- Using Composer
- Read & Create Spreadsheet

TODAY's OUTLINE

- Database Introduction
- Database Design
- Database Connection
- Database Manipulation
- Multiple Tables Manipulation

What is a Database

- Database: A database is an organized collection of data. In MySQL you often create separate databases for each of your projects
- Table: A table is a collection of similar information. In MySQL you might have a Customers table that contains data about your customers, a Products table that has data about your products, an Order Headers table that contains header and totals about your orders, and an Order Details table that contains the line items on the orders.
- Row: Inside a table, you have rows. Each row is a related set of data. In the Customers table, each customer is in a row.
- Record: A record is another for a row.
- Column: Inside your table you also have columns. Columns are the types of information you are storing in your table. For instance in the Customers table, name, street, and city would be columns.

What is a Database

- Field: A field is another word for a column. Sometimes used to refer to a specific row’s column.
- Value: A value is what is in a given cell. In the Customers table, for instance, you would have a row for George Smith where the value of the cell in the name column is “George Smith.”
- Relationship: A relationship is a link between two tables. For instance, an Order Details table would link to the Order Headers so that you can associate the line items with the correct order.
- Key: A key is a field, or fields, that link the tables. In the Order Details table you have an order number field that matches an order number field in the Order Headers table. The order number field is a key or key field.
- Index: An index is an internal system that a database system uses to locate information more quickly. In MySQL you can specify that certain columns, usually keys, are indexes.

Gathering Information to Define Database

- Finding out about business
- Purpose & Objective of the Database
- Are there existing database?
- Spreadsheet & forms being used

Designing Table

- Organize list of different data into tables and fields
- Data that can be calculated generally does not belong in a database, you can create functions in PHP to do the calculation when needed.

Table Relationships

- **Primary Key:**
  - Unique: The primary key must be unique. If it is not unique then you are not able to match to a single record.
  - Not null and not optional: There must always be something in the field.
  - Not changeable: There should be no reason you should need to change the field. If you use a person’s name for the primary key and the person changes his name, then all the tables trying to link with the old name won’t work.
  - Should not violate security policies: In other words, do not use something as a key that needs to be private, such as a Social Security number or a password

Table Relationships

- **Primary Key:**
  - Artificial keys → new field whose only purpose is to be the primary key
  - Usually using integer → fast to process & do not take much room in the database
  - Auto_increment

Tables Normalization

- Normalization is a process for assigning attributes to entities. It reduces data redundancies and helps eliminate the data anomalies
- Normalization works through a series of stages called normal forms:
  - First normal form (1NF)
  - Second normal form (2NF)
  - Third normal form (3NF)
  - Fourth normal form (4NF)
- The highest level of normalization is not always desirable for real-world reasons

The Normalization Process

- Each table represents a single subject
- No data item will be unnecessarily stored in more than one table
- All attributes in a table are dependent on primary key

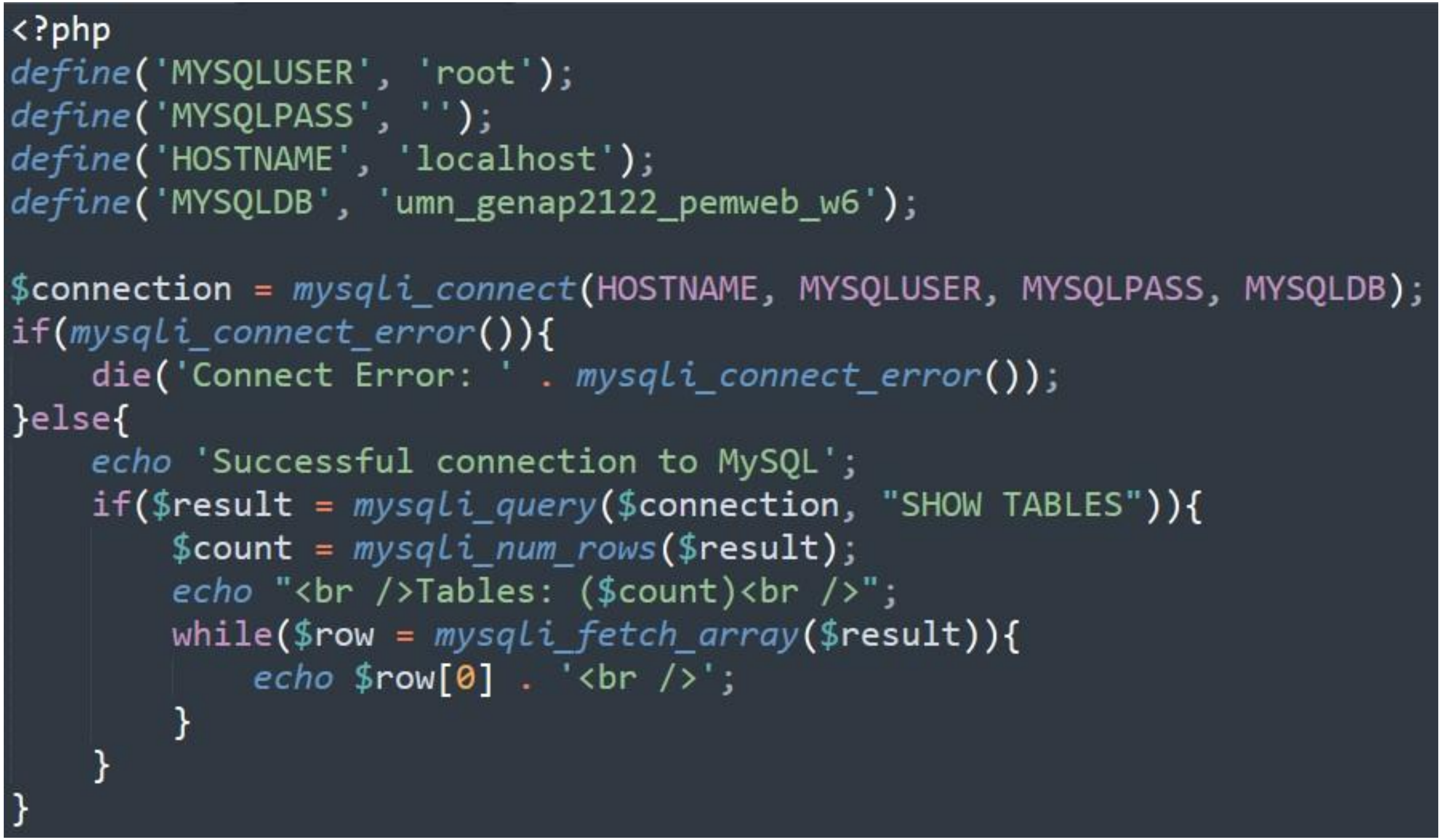
Normalization and Database Design

- Normalization should be part of the design process
    - Many real world DBs have been naively created and suffered from resulting anomalies
- E-R Diagram provides macro view
- Normalization provides micro view of entities
    - Focuses on characteristics of specific entities
    - May yield additional entities
- Difficult to separate normalization from E-R modeling
- Business rules must be determined for BOTH.

Database Manipulation

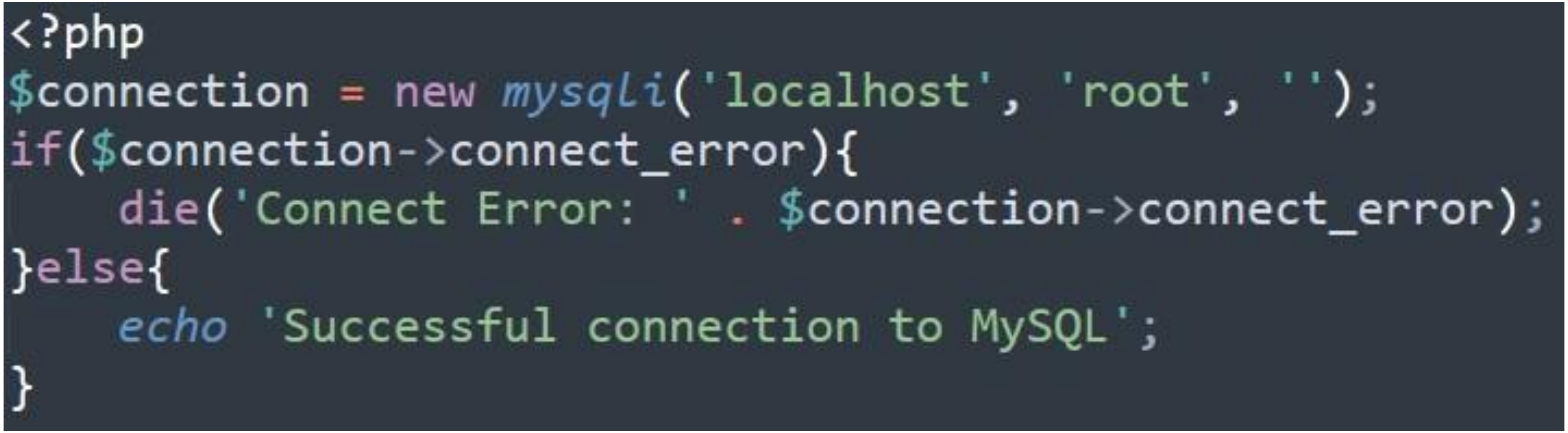
- Connecting with MySQLi
  - Mysql was the traditional way to communicate with MySQL. When mysqli came alongin PHP 5, it added the following features:
    - Object-oriented interface
    - Support for prepared statements
    - Support for multiple statements
    - Support for transactions

Procedural Style of MySQLi



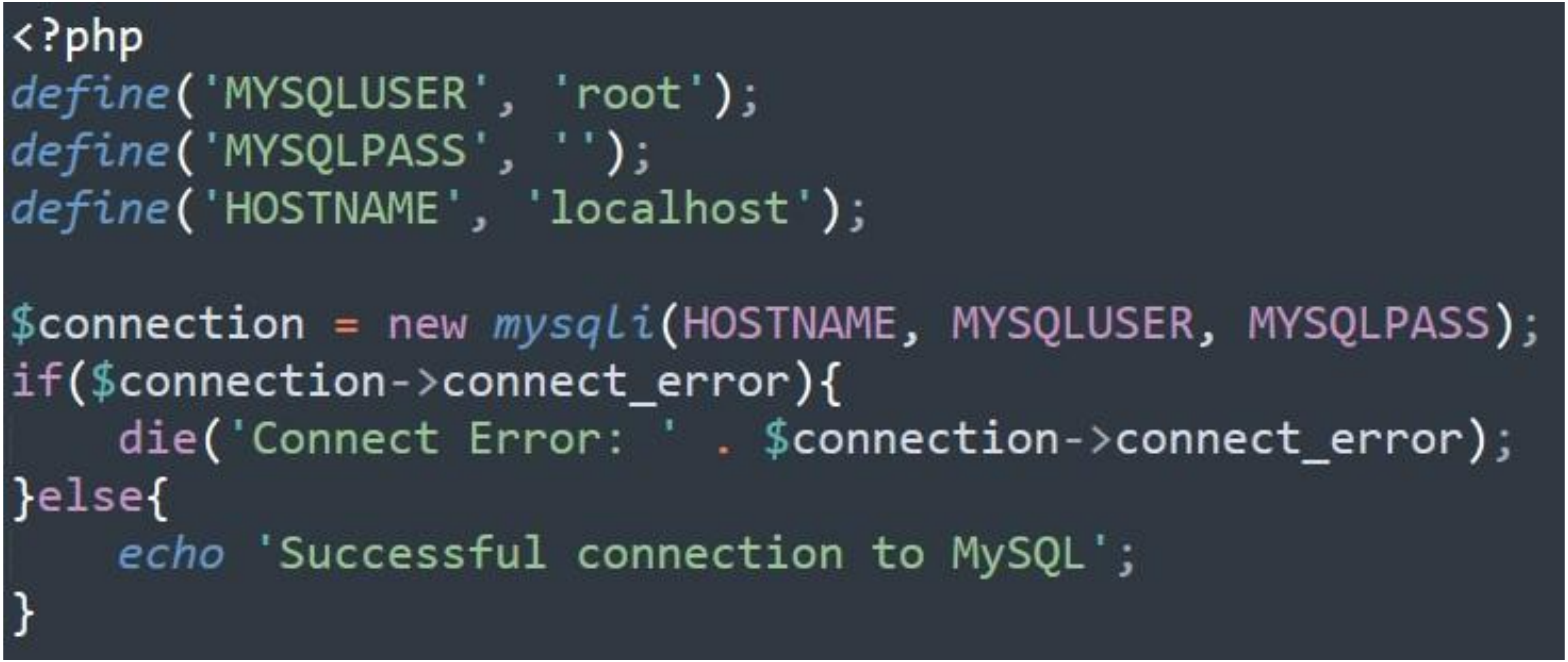
```php
<?php
define('MYSQLUSER', 'root');
define('MYSQLPASS', '');
define('HOSTNAME', 'localhost');
define('MYSQLDB', 'umn_genap2122_pemweb_w6');

$connection = mysqli_connect(HOSTNAME, MYSQLUSER, MYSQLPASS, MYSQLDB);
if(mysqli_connect_error()){
    die('Connect Error: ' . mysqli_connect_error());
}else{
    echo 'Successful connection to MySQL';
    if($result = mysqli_query($connection, "SHOW TABLES")){
        $count = mysqli_num_rows($result);
        echo "<br />Tables: ($count)<br />";
        while($row = mysqli_fetch_array($result)){
            echo $row[0] . '<br />';
        }
    }
}
```

OO Style of MySQLi (1)



```php
<?php
$connection = new mysqli('localhost', 'root', '');
if($connection->connect_error){
    die('Connect Error: ' . $connection->connect_error);
}else{
    echo 'Successful connection to MySQL';
}
```

OO Style of MySQLi (2)

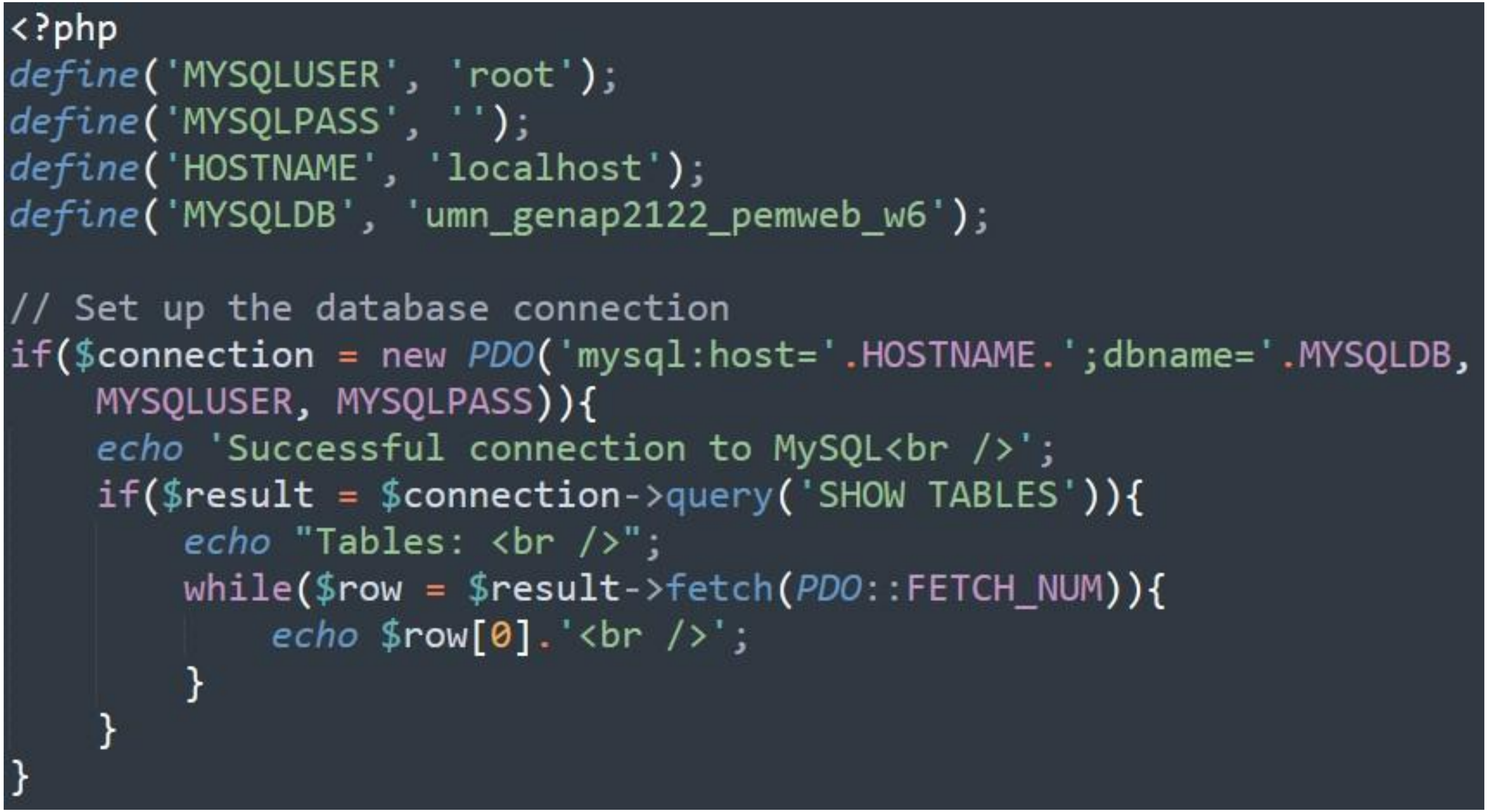


```php
<?php
define('MYSQLUSER', 'root');
define('MYSQLPASS', '');
define('HOSTNAME', 'localhost');

$connection = new mysqli(HOSTNAME, MYSQLUSER, MYSQLPASS);
if($connection->connect_error){
    die('Connect Error: ' . $connection->connect_error);
}else{
    echo 'Successful connection to MySQL';
}
```

Connecting with PDO

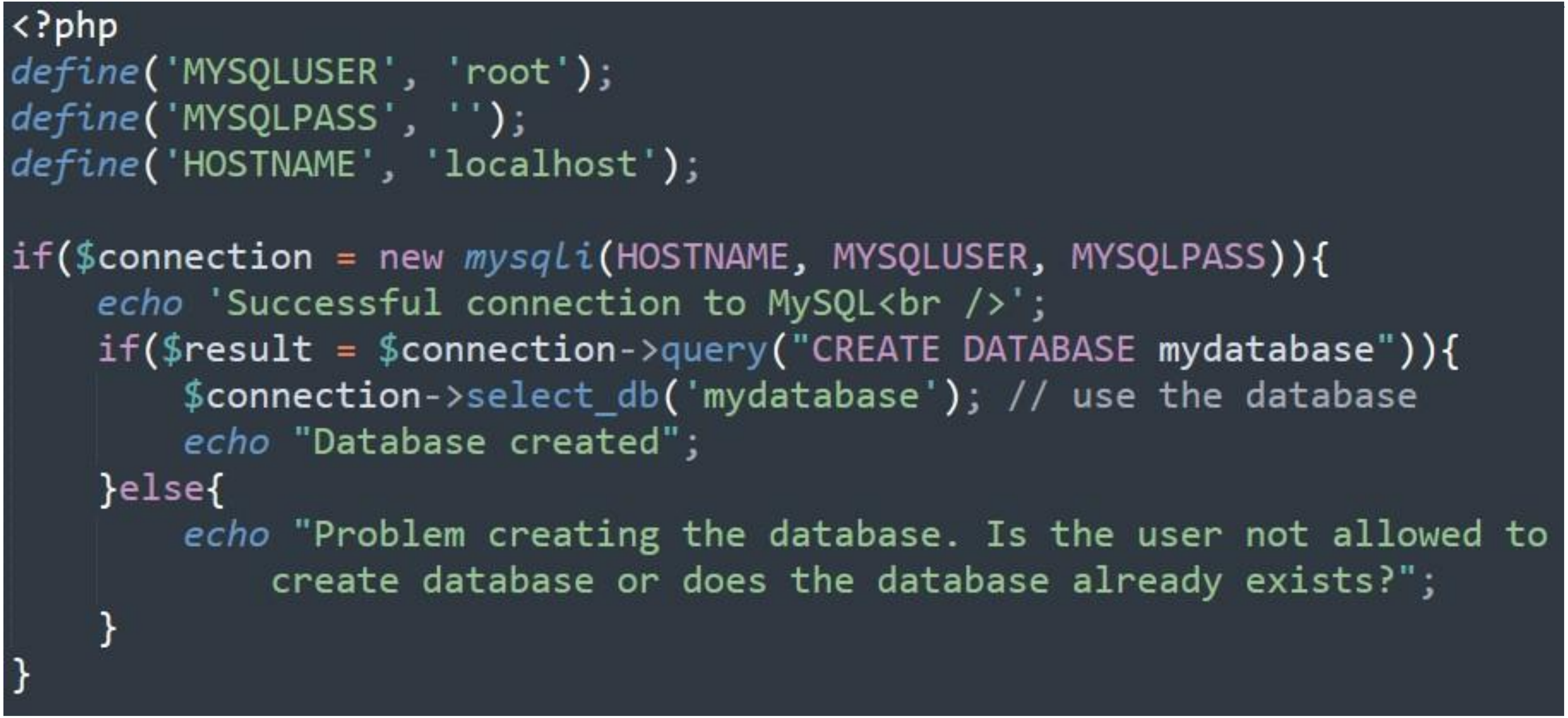
- **PDO Features:**
    - Object oriented interface
    - Support for prepared statements
    - Support for transactions

Connecting with PDO



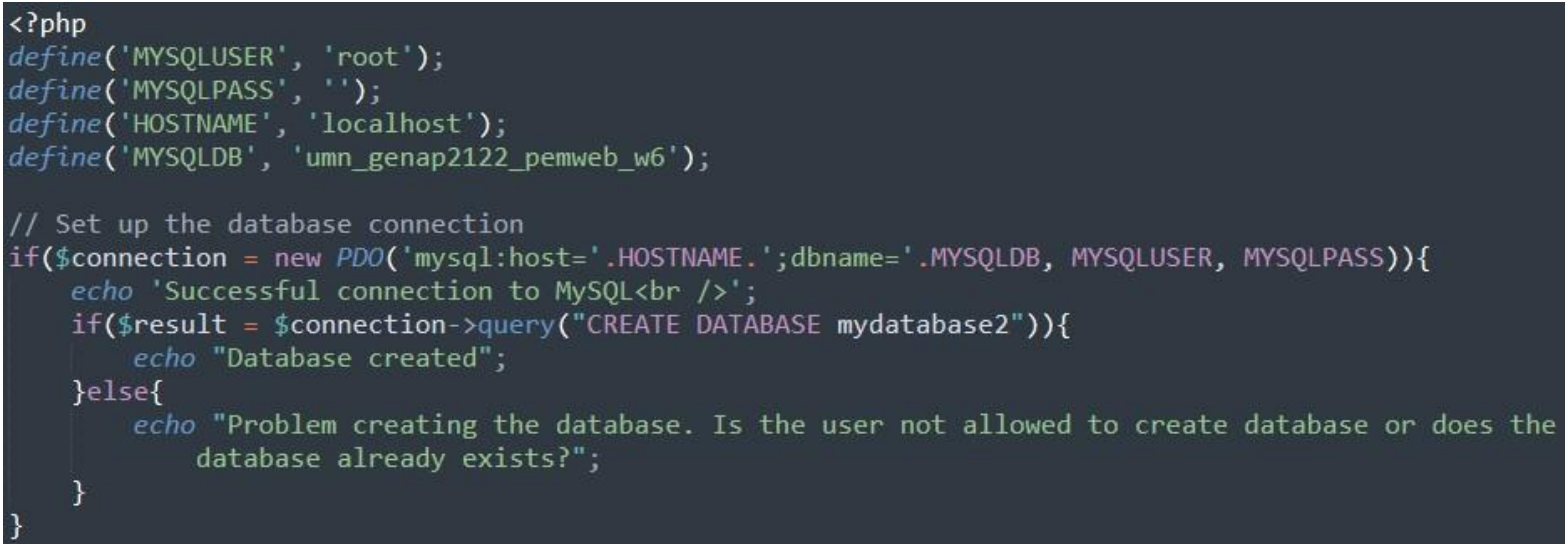
```php
<?php
define('MYSQLUSER', 'root');
define('MYSQLPASS', '');
define('HOSTNAME', 'localhost');
define('MYSQLDB', 'umn_genap2122_pemweb_w6');

// Set up the database connection
if($connection = new PDO('mysql:host='.HOSTNAME.';dbname='.MYSQLDB,
    MYSQLUSER, MYSQLPASS)){
    echo 'Successful connection to MySQL<br />';
    if($result = $connection->query('SHOW TABLES')){
        echo "Tables: <br />";
        while($row = $result->fetch(PDO::FETCH_NUM)){
            echo $row[0].'<br />';
        }
    }
}
```

Creating Database (MySQLi)



```php
<?php
define('MYSQLUSER', 'root');
define('MYSQLPASS', '');
define('HOSTNAME', 'localhost');

if($connection = new mysqli(HOSTNAME, MYSQLUSER, MYSQLPASS)){
    echo 'Successful connection to MySQL<br />';
    if($result = $connection->query("CREATE DATABASE mydatabase")){
        $connection->select_db('mydatabase'); // use the database
        echo "Database created";
    }else{
        echo "Problem creating the database. Is the user not allowed to
            create database or does the database already exists?";
    }
}
```

Creating Database (PDO)

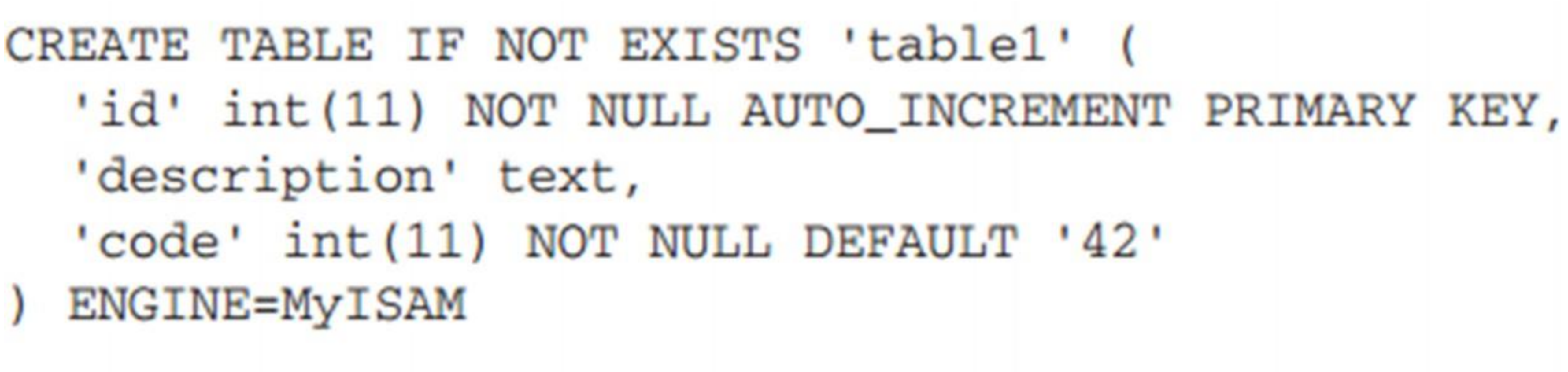


```
<?php
define('MYSQLUSER', 'root');
define('MYSQLPASS', '');
define('HOSTNAME', 'localhost');
define('MYSQLDB', 'umn_genap2122_pemweb_w6');

// Set up the database connection
if($connection = new PDO('mysql:host='.HOSTNAME.';dbname='.MYSQLDB, MYSQLUSER, MYSQLPASS)){
    echo 'Successful connection to MySQL<br />';
    if($result = $connection->query("CREATE DATABASE mydatabase2")){
        echo "Database created";
    }else{
        echo "Problem creating the database. Is the user not allowed to create database or does the
            database already exists?";
    }
}
```

Executing MySQL Commands in PHP

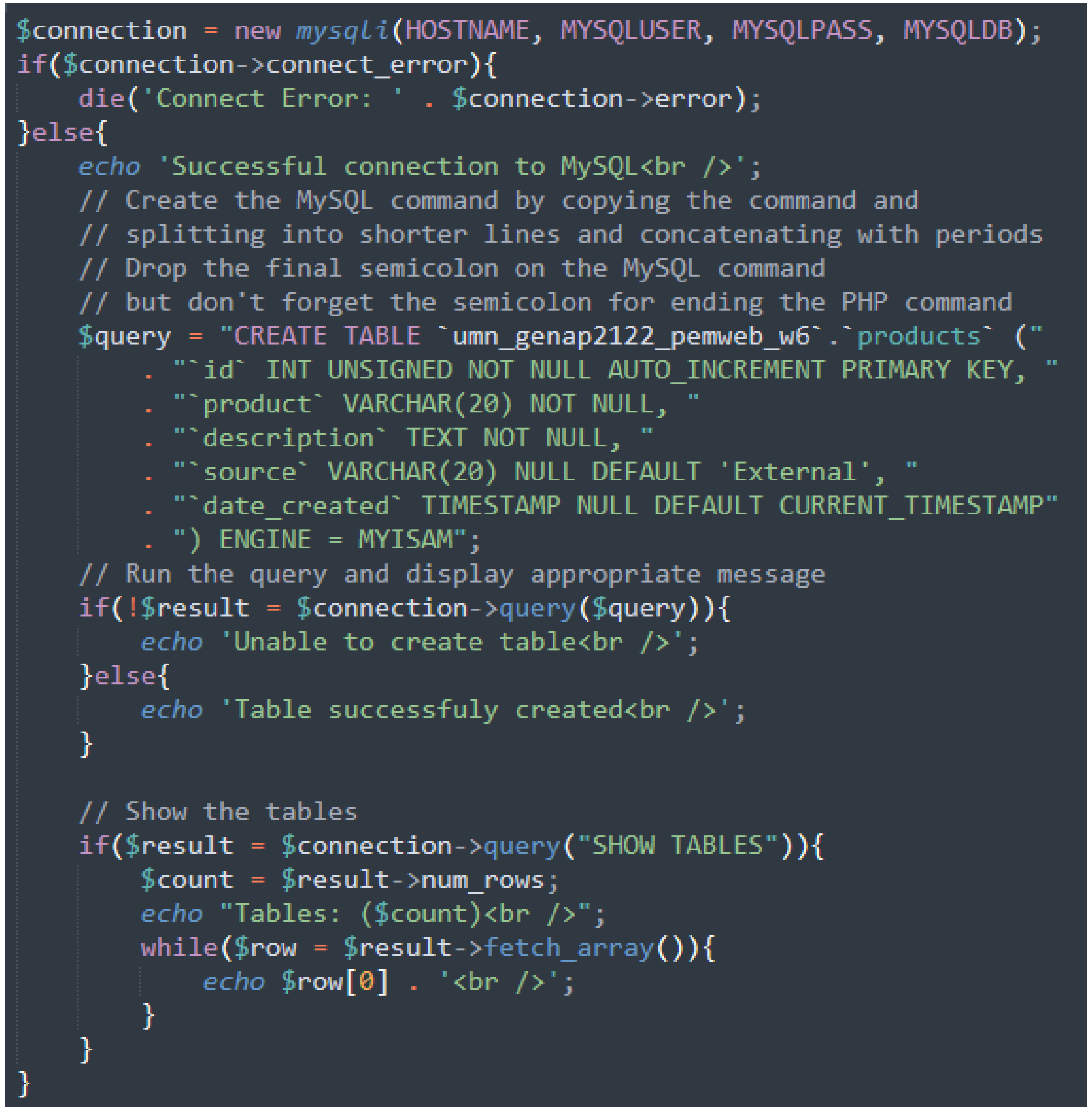
1. Make a connection to the database
2. Create a safe query with the command
3. Run the query

Create Table



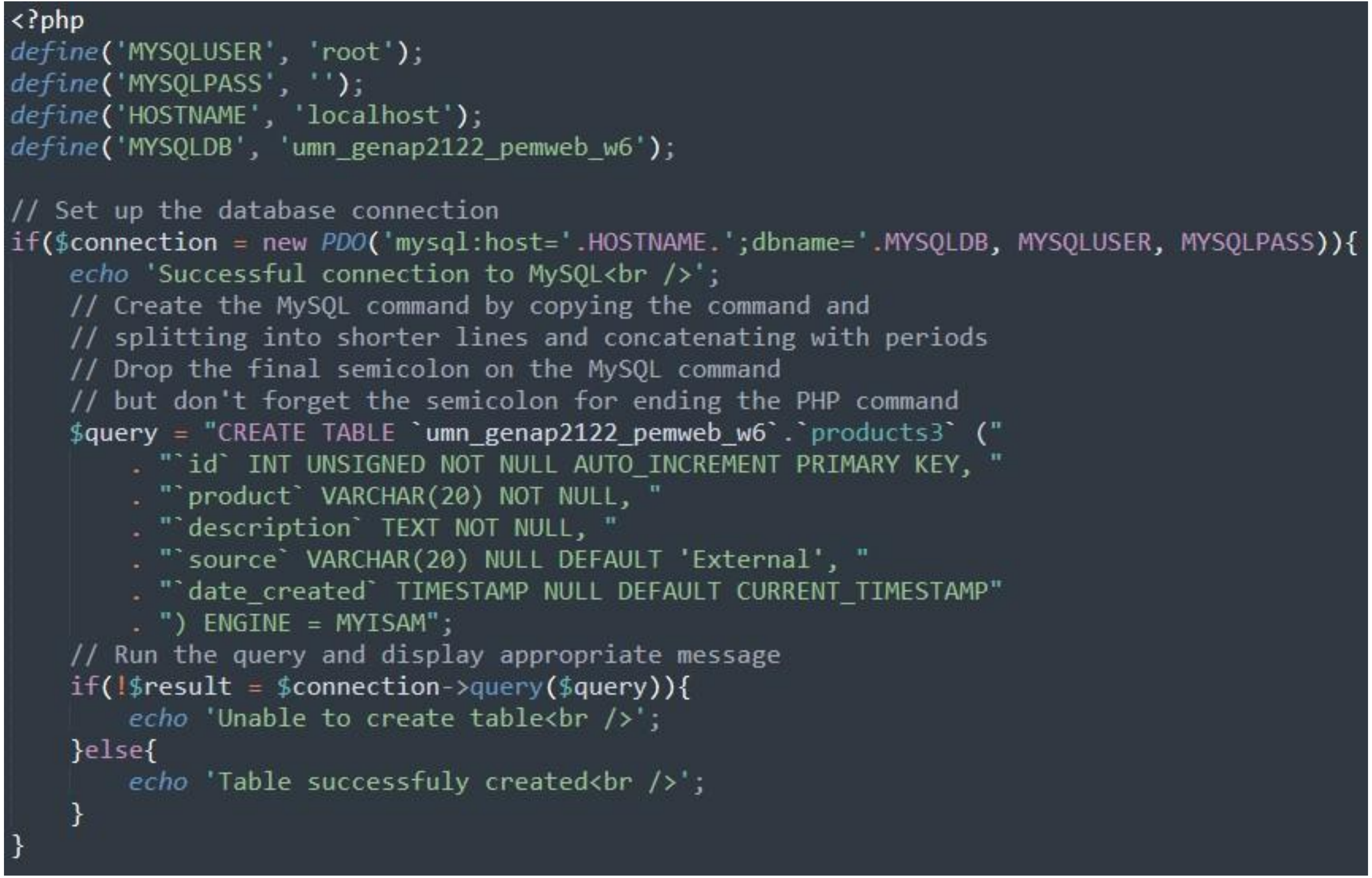
```
CREATE TABLE IF NOT EXISTS 'table1' (
  'id' int(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  'description' text,
  'code' int(11) NOT NULL DEFAULT '42'
) ENGINE=MyISAM
```

Create Table



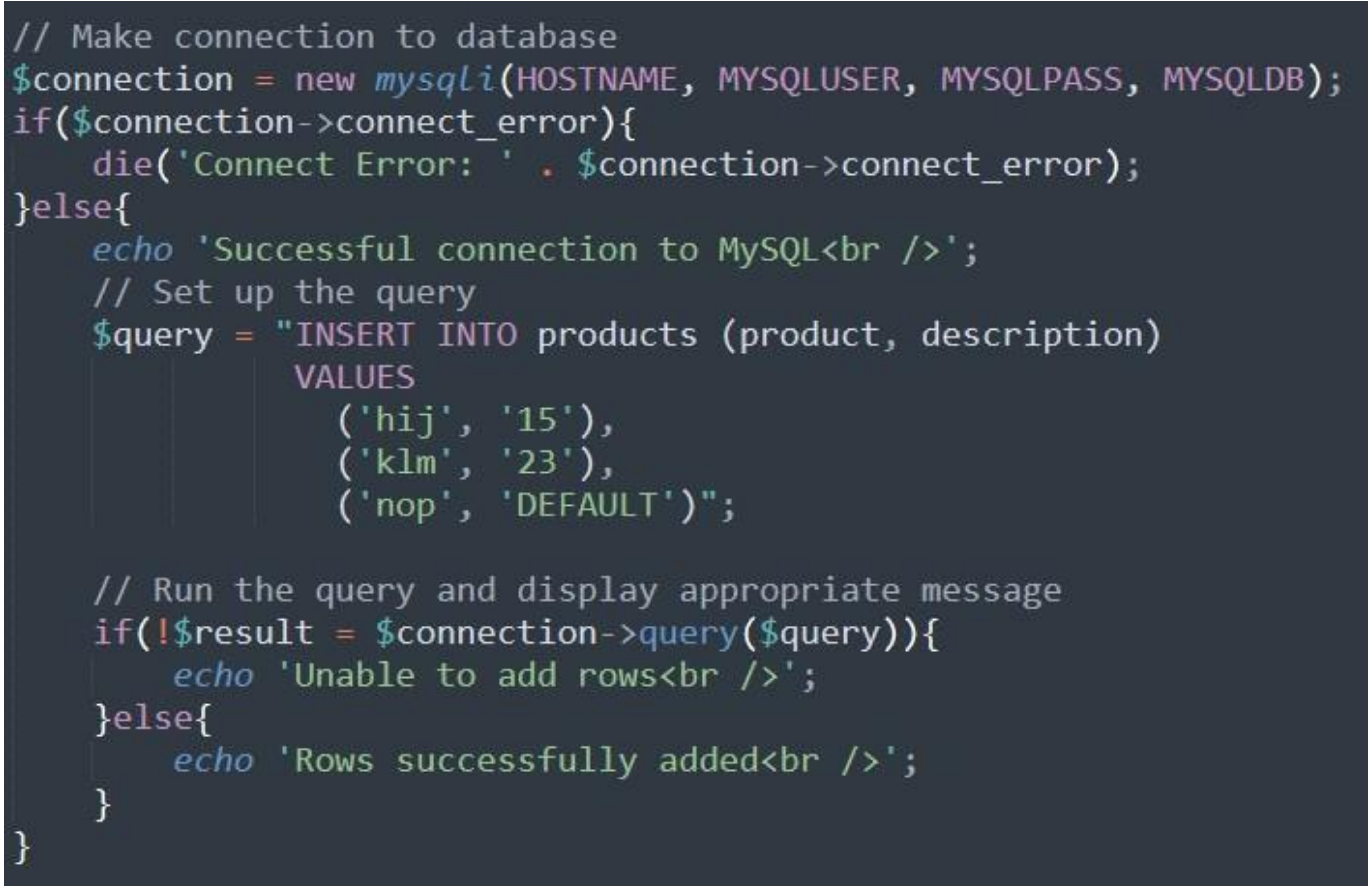
```
$connection = new mysqli(HOSTNAME, MYSQLUSER, MYSQLPASS, MYSQLDB);
if($connection->connect_error){
    die('Connect Error: ' . $connection->error);
}else{
    echo 'Successful connection to MySQL<br />';
    // Create the MySQL command by copying the command and
    // splitting into shorter lines and concatenating with periods
    // Drop the final semicolon on the MySQL command
    // but don't forget the semicolon for ending the PHP command
    $query = "CREATE TABLE `umn_genap2122_pemweb_w6`.`products` ("
        . "`id` INT UNSIGNED NOT NULL AUTO_INCREMENT PRIMARY KEY, "
        . "`product` VARCHAR(20) NOT NULL, "
        . "`description` TEXT NOT NULL, "
        . "`source` VARCHAR(20) NULL DEFAULT 'External', "
        . "`date_created` TIMESTAMP NULL DEFAULT CURRENT_TIMESTAMP"
        . ") ENGINE = MYISAM";
    // Run the query and display appropriate message
    if(!$result = $connection->query($query)){
        echo 'Unable to create table<br />';
    }else{
        echo 'Table successfuly created<br />';
    }

    // Show the tables
    if($result = $connection->query("SHOW TABLES")){
        $count = $result->num_rows;
        echo "Tables: ($count)<br />";
        while($row = $result->fetch_array()){
            echo $row[0] . '<br />';
        }
    }
}
```

Create Table (PDO)



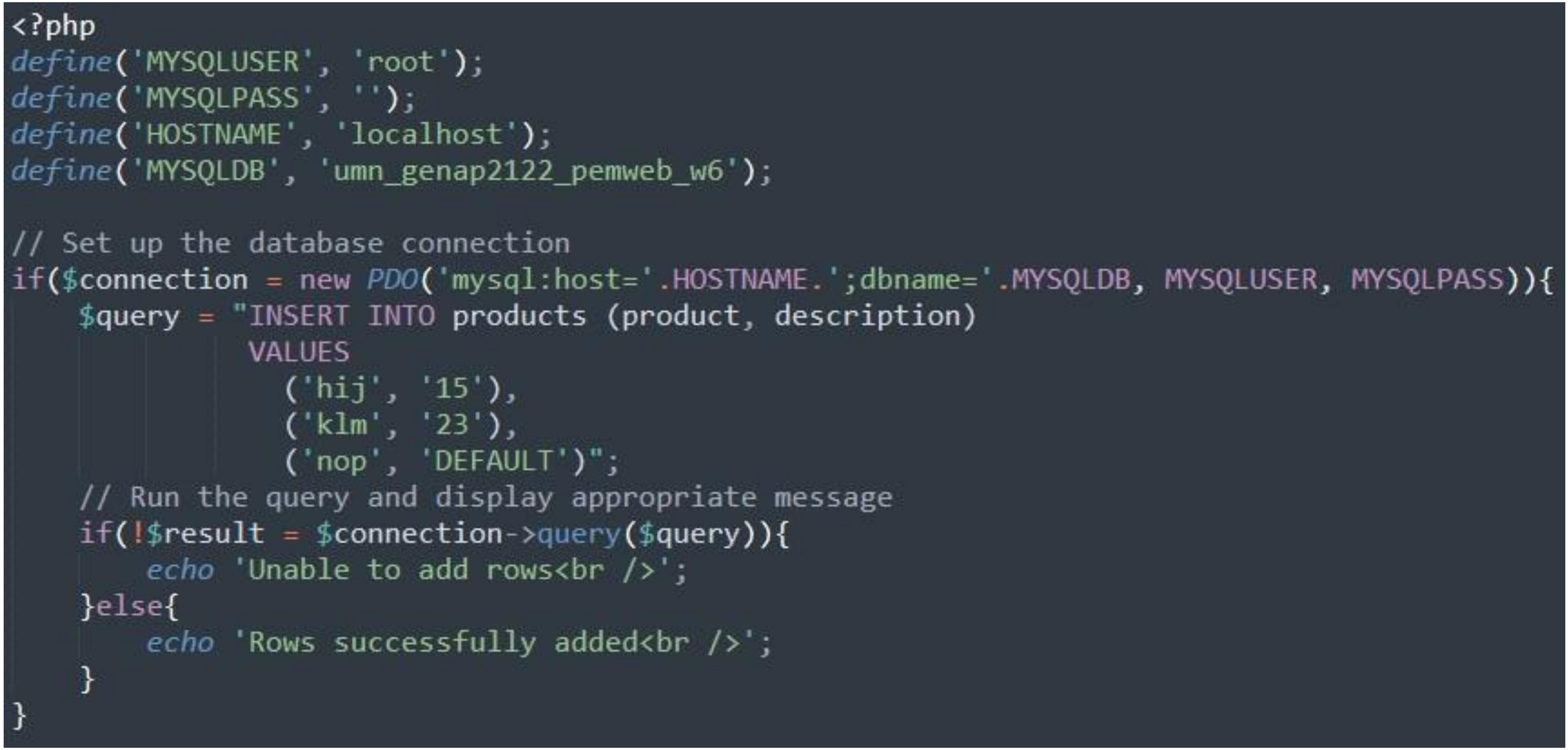
```php
<?php
define('MYSQLUSER', 'root');
define('MYSQLPASS', '');
define('HOSTNAME', 'localhost');
define('MYSQLDB', 'umn_genap2122_pemweb_w6');

// Set up the database connection
if($connection = new PDO('mysql:host='.HOSTNAME.';dbname='.MYSQLDB, MYSQLUSER, MYSQLPASS)){
    echo 'Successful connection to MySQL<br />';
    // Create the MySQL command by copying the command and
    // splitting into shorter lines and concatenating with periods
    // Drop the final semicolon on the MySQL command
    // but don't forget the semicolon for ending the PHP command
    $query = "CREATE TABLE `umn_genap2122_pemweb_w6`.`products3` ("
        . "`id` INT UNSIGNED NOT NULL AUTO_INCREMENT PRIMARY KEY, "
        . "`product` VARCHAR(20) NOT NULL, "
        . "`description` TEXT NOT NULL, "
        . "`source` VARCHAR(20) NULL DEFAULT 'External', "
        . "`date_created` TIMESTAMP NULL DEFAULT CURRENT_TIMESTAMP"
        . ") ENGINE = MYISAM";
    // Run the query and display appropriate message
    if(!$result = $connection->query($query)){
        echo 'Unable to create table<br />';
    }else{
        echo 'Table successfuly created<br />';
    }
}
```

Insert Data with PHP (MySQLi)



```php
// Make connection to database
$connection = new mysqli(HOSTNAME, MYSQLUSER, MYSQLPASS, MYSQLDB);
if($connection->connect_error){
    die('Connect Error: ' . $connection->connect_error);
}else{
    echo 'Successful connection to MySQL<br />';
    // Set up the query
    $query = "INSERT INTO products (product, description)
              VALUES
                ('hij', '15'),
                ('klm', '23'),
                ('nop', 'DEFAULT')";

    // Run the query and display appropriate message
    if(!$result = $connection->query($query)){
        echo 'Unable to add rows<br />';
    }else{
        echo 'Rows successfully added<br />';
    }
}
```

Insert Data with PHP (PDO)

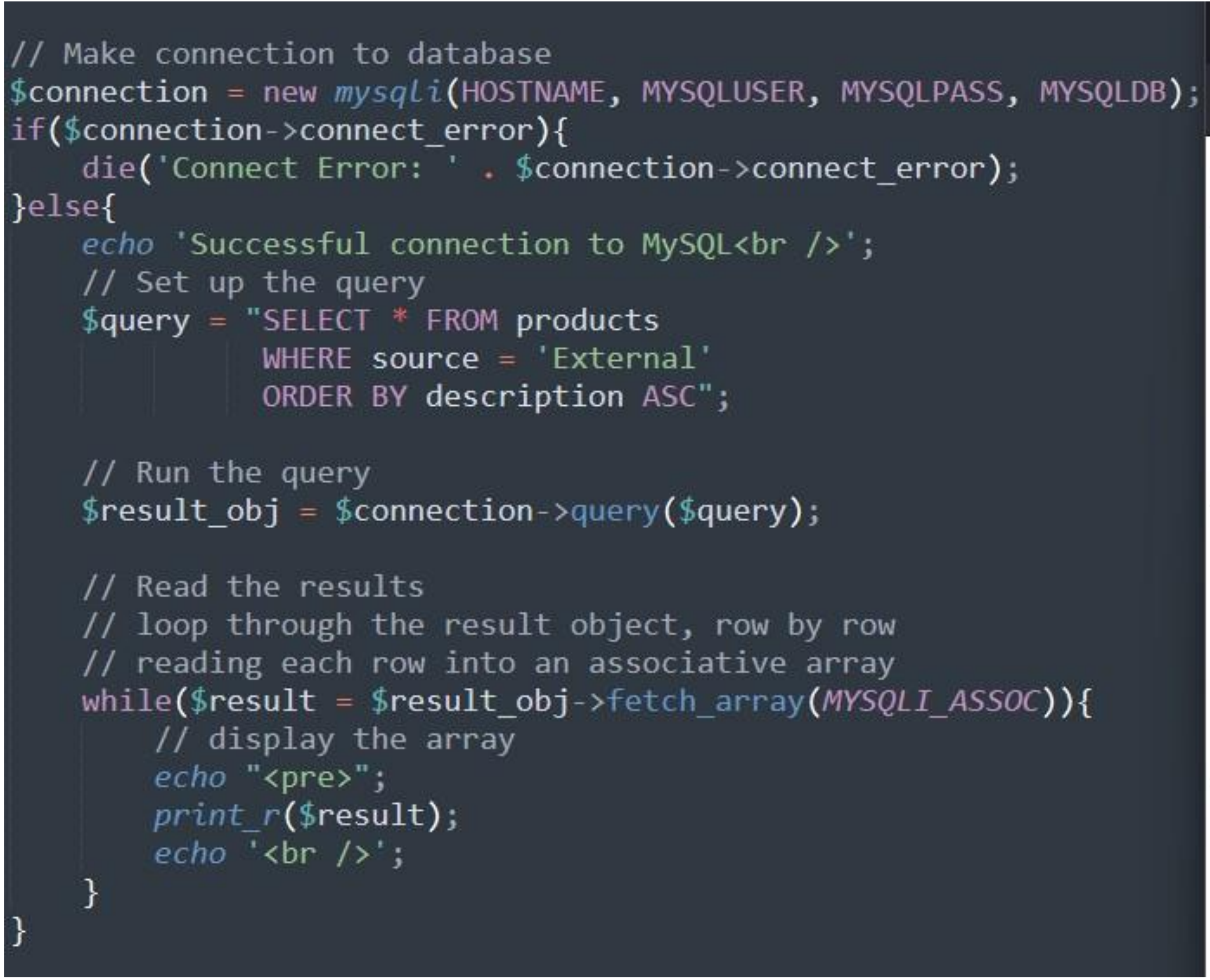


```php
<?php
define('MYSQLUSER', 'root');
define('MYSQLPASS', '');
define('HOSTNAME', 'localhost');
define('MYSQLDB', 'umn_genap2122_pemweb_w6');

// Set up the database connection
if($connection = new PDO('mysql:host='.HOSTNAME.';dbname='.MYSQLDB, MYSQLUSER, MYSQLPASS)){
    $query = "INSERT INTO products (product, description)
              VALUES
                ('hij', '15'),
                ('klm', '23'),
                ('nop', 'DEFAULT')";
    // Run the query and display appropriate message
    if(!$result = $connection->query($query)){
        echo 'Unable to add rows<br />';
    }else{
        echo 'Rows successfully added<br />';
    }
}
```

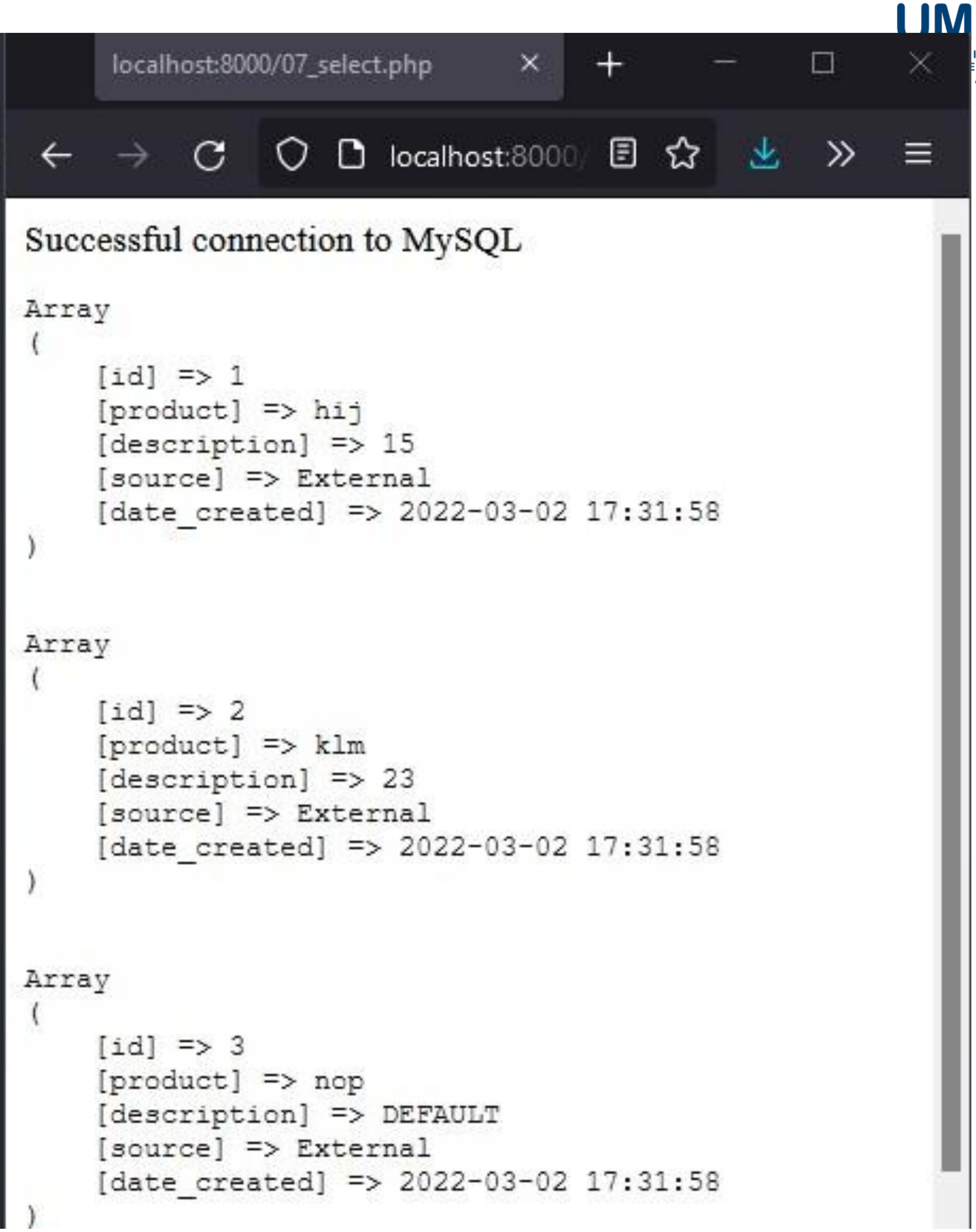
Selecting Data in PHP

1. Make a connection to the database
2. Create a safe query with the command
3. Run the query
4. Read the result

Selecting Data in PHP (MySQLi)

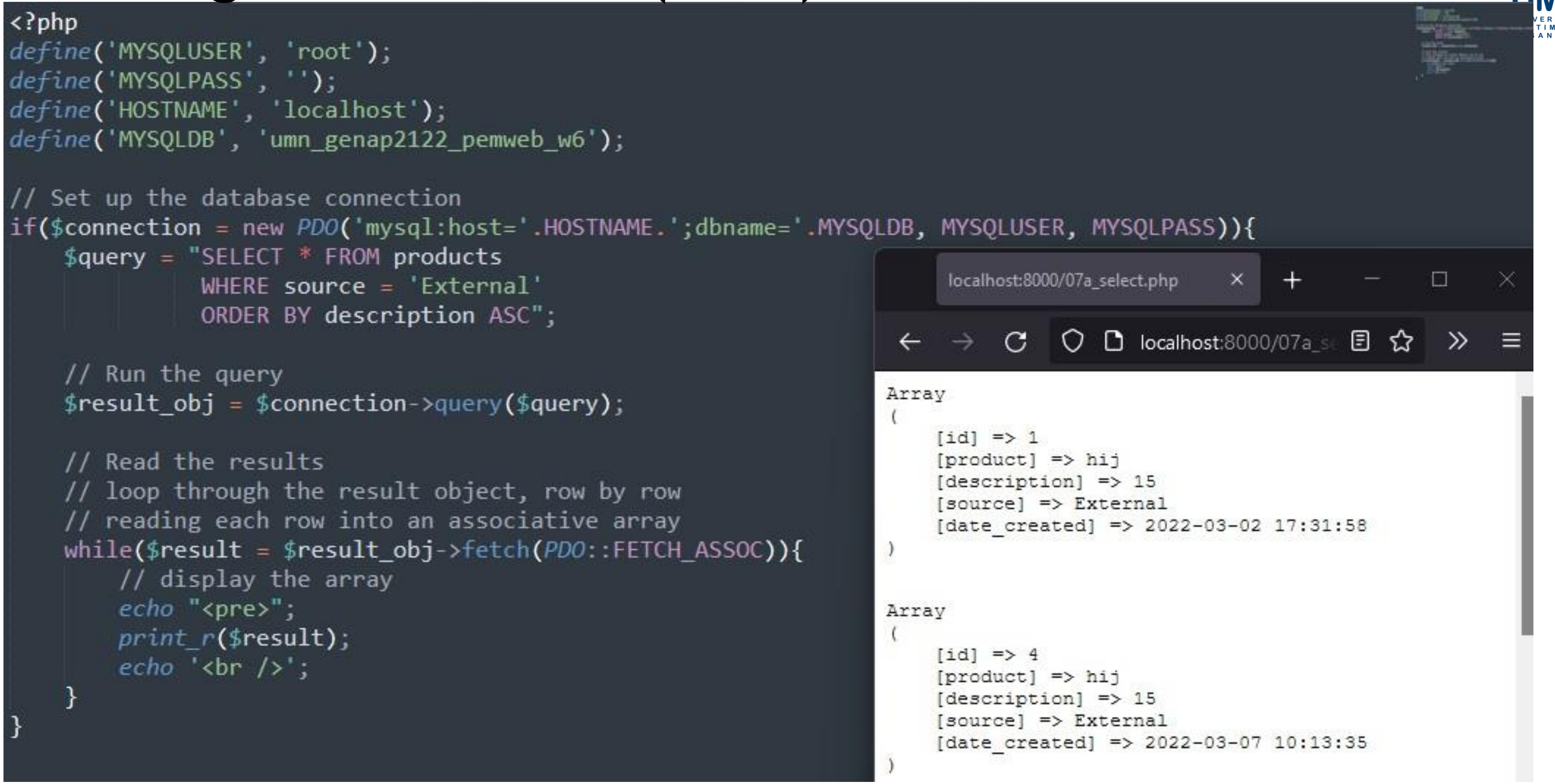


```
// Make connection to database
$connection = new mysqli(HOSTNAME, MYSQLUSER, MYSQLPASS, MYSQLDB);
if($connection->connect_error){
    die('Connect Error: ' . $connection->connect_error);
}else{
    echo 'Successful connection to MySQL<br />';
    // Set up the query
    $query = "SELECT * FROM products
              WHERE source = 'External'
              ORDER BY description ASC";

    // Run the query
    $result_obj = $connection->query($query);

    // Read the results
    // loop through the result object, row by row
    // reading each row into an associative array
    while($result = $result_obj->fetch_array(MYSQLI_ASSOC)){
        // display the array
        echo "<pre>";
        print_r($result);
        echo '<br />';
    }
}
```



```
Successful connection to MySQL

Array
(
    [id] => 1
    [product] => hij
    [description] => 15
    [source] => External
    [date_created] => 2022-03-02 17:31:58
)


Array
(
    [id] => 2
    [product] => klm
    [description] => 23
    [source] => External
    [date_created] => 2022-03-02 17:31:58
)


Array
(
    [id] => 3
    [product] => nop
    [description] => DEFAULT
    [source] => External
    [date_created] => 2022-03-02 17:31:58
)
```

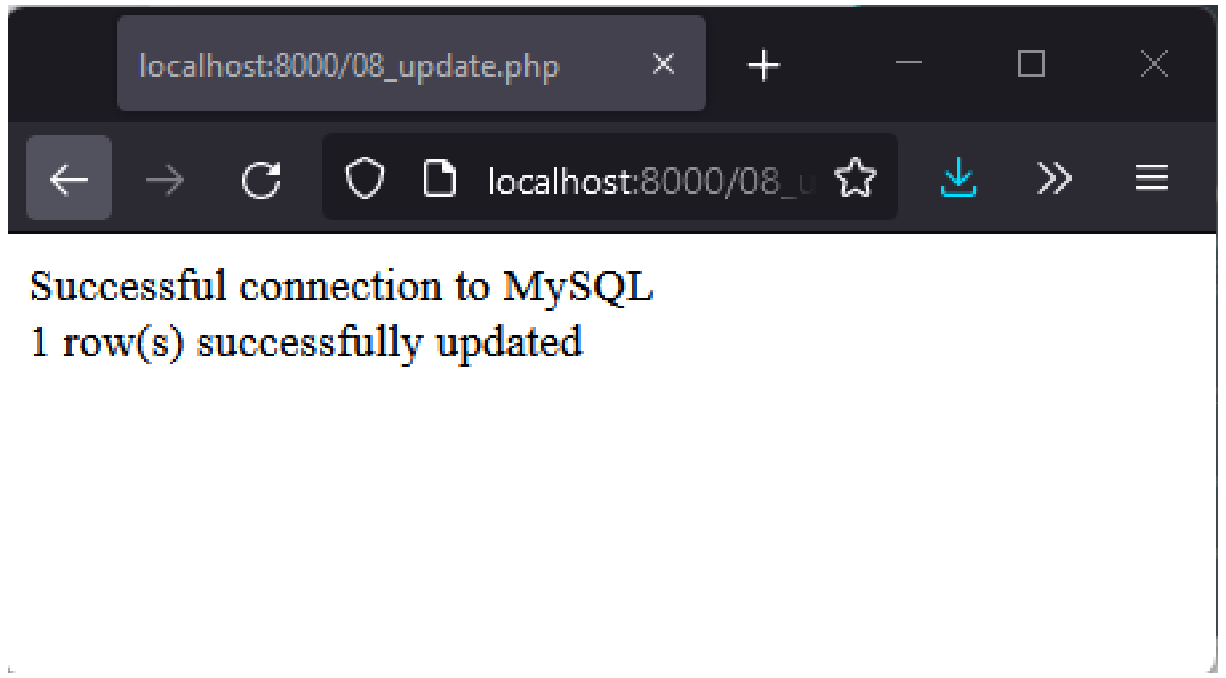
Selecting Data in PHP (PDO)



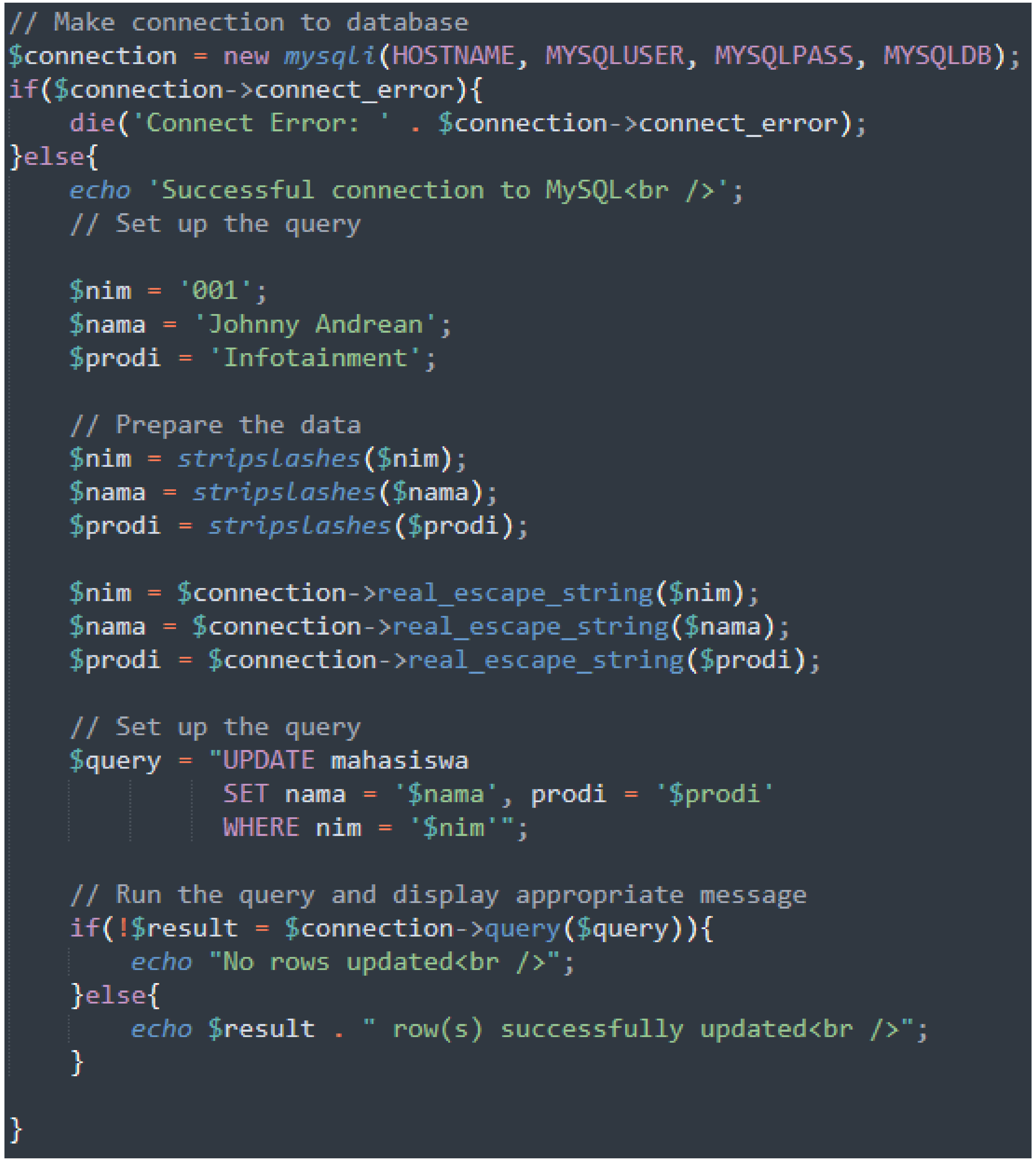
```php
<?php
define('MYSQLUSER', 'root');
define('MYSQLPASS', '');
define('HOSTNAME', 'localhost');
define('MYSQLDB', 'umn_genap2122_pemweb_w6');

// Set up the database connection
if($connection = new PDO('mysql:host='.HOSTNAME.';dbname='.MYSQLDB, MYSQLUSER, MYSQLPASS)){
    $query = "SELECT * FROM products
              WHERE source = 'External'
              ORDER BY description ASC";

    // Run the query
    $result_obj = $connection->query($query);

    // Read the results
    // loop through the result object, row by row
    // reading each row into an associative array
    while($result = $result_obj->fetch(PDO::FETCH_ASSOC)){
        // display the array
        echo "<pre>";
        print_r($result);
        echo '<br />';
    }
}
```

```
Array
(
    [id] => 1
    [product] => hij
    [description] => 15
    [source] => External
    [date_created] => 2022-03-02 17:31:58
)


Array
(
    [id] => 4
    [product] => hij
    [description] => 15
    [source] => External
    [date_created] => 2022-03-07 10:13:35
)
```

Updating Data in PHP (MySQLi)

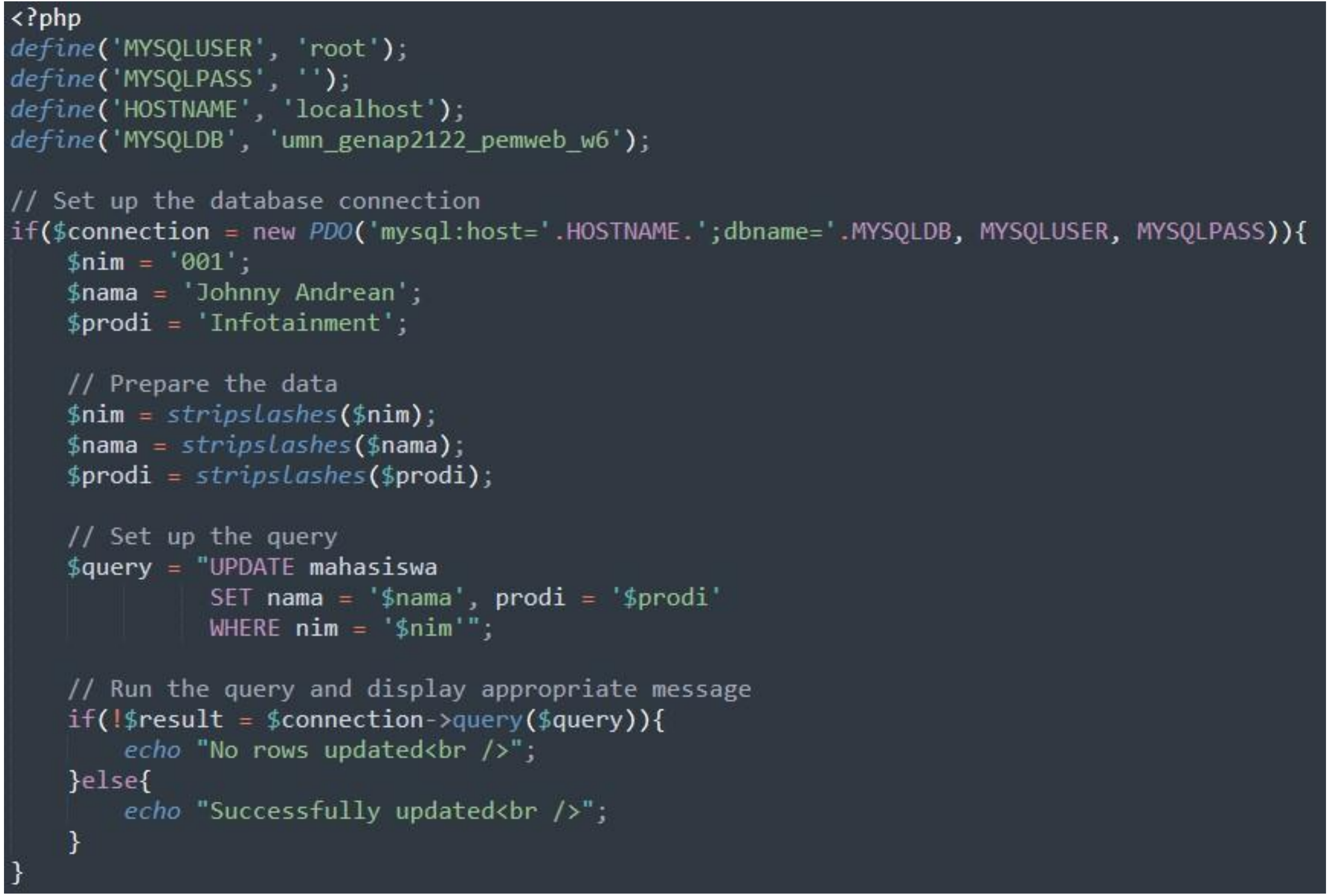


```
Successful connection to MySQL
1 row(s) successfully updated
```



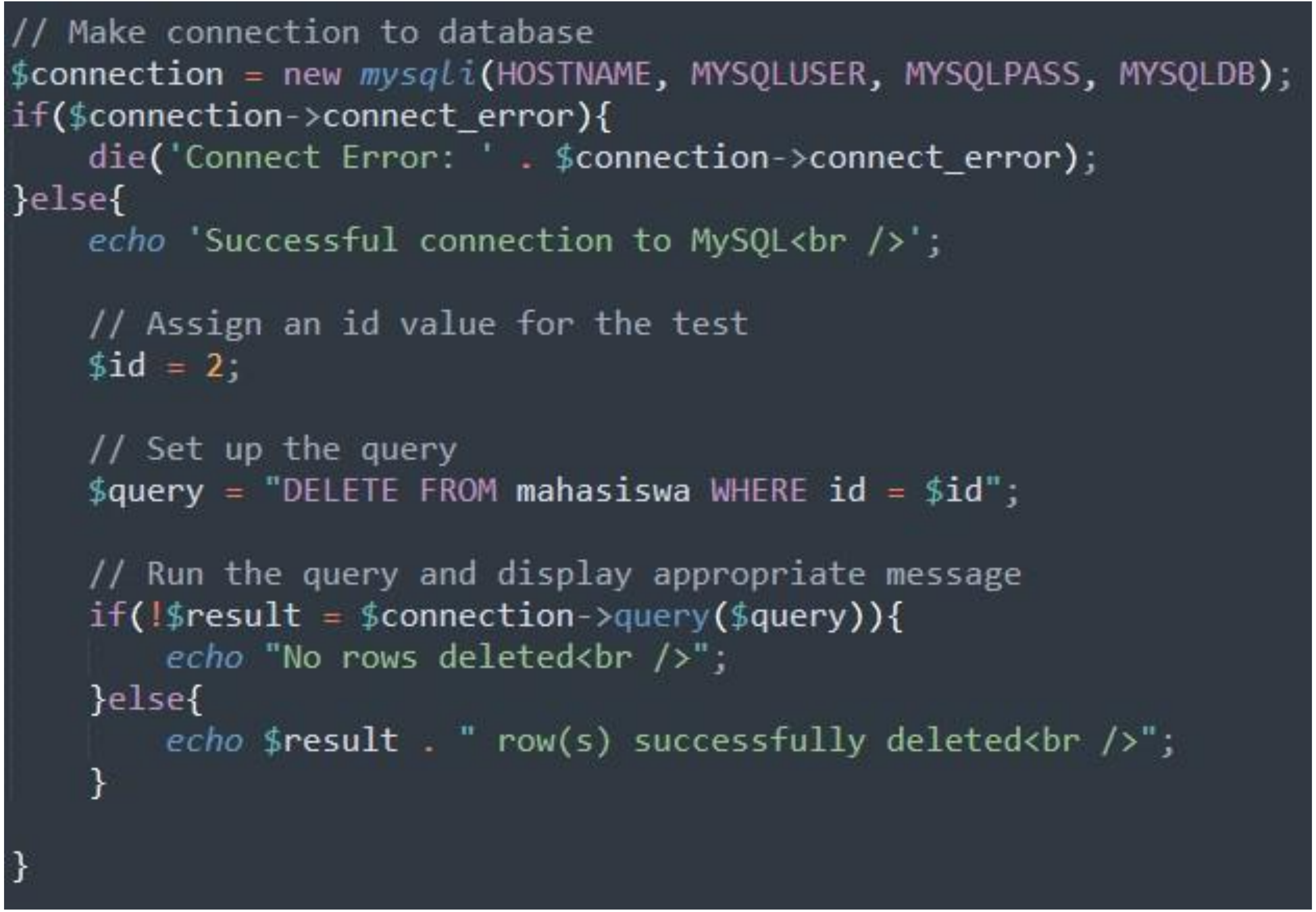
```php
// Make connection to database
$connection = new mysqli(HOSTNAME, MYSQLUSER, MYSQLPASS, MYSQLDB);
if($connection->connect_error){
    die('Connect Error: ' . $connection->connect_error);
}else{
    echo 'Successful connection to MySQL<br />';
    // Set up the query

    $nim = '001';
    $nama = 'Johnny Andrean';
    $prodi = 'Infotainment';

    // Prepare the data
    $nim = stripslashes($nim);
    $nama = stripslashes($nama);
    $prodi = stripslashes($prodi);

    $nim = $connection->real_escape_string($nim);
    $nama = $connection->real_escape_string($nama);
    $prodi = $connection->real_escape_string($prodi);

    // Set up the query
    $query = "UPDATE mahasiswa
              SET nama = '$nama', prodi = '$prodi'
              WHERE nim = '$nim'";

    // Run the query and display appropriate message
    if(!$result = $connection->query($query)){
        echo "No rows updated<br />";
    }else{
        echo $result . " row(s) successfully updated<br />";
    }

}
```

Updating Data in PHP (PDO)



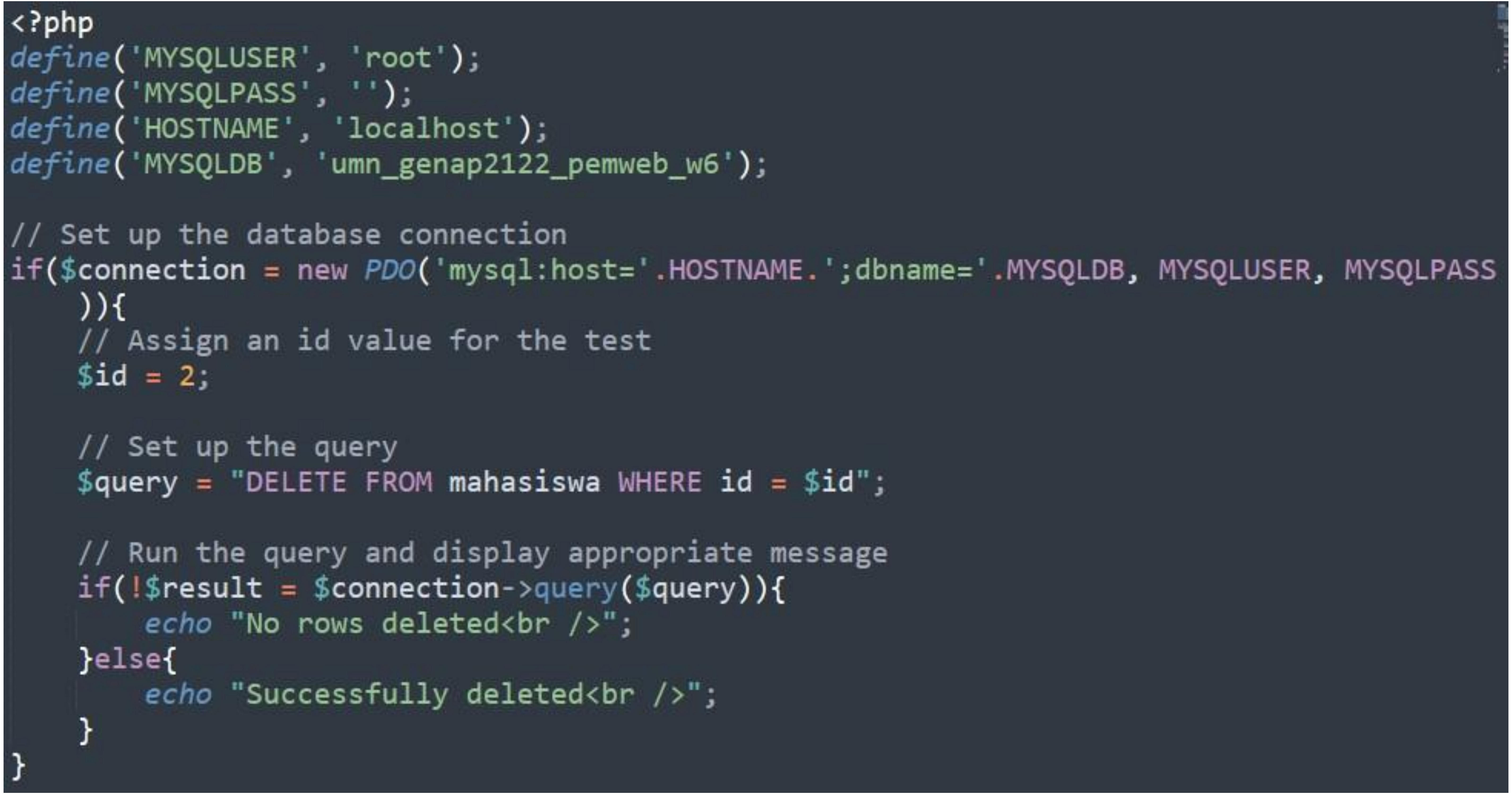
```php
<?php
define('MYSQLUSER', 'root');
define('MYSQLPASS', '');
define('HOSTNAME', 'localhost');
define('MYSQLDB', 'umn_genap2122_pemweb_w6');

// Set up the database connection
if($connection = new PDO('mysql:host='.HOSTNAME.';dbname='.MYSQLDB, MYSQLUSER, MYSQLPASS)){
    $nim = '001';
    $nama = 'Johnny Andrean';
    $prodi = 'Infotainment';

    // Prepare the data
    $nim = stripslashes($nim);
    $nama = stripslashes($nama);
    $prodi = stripslashes($prodi);

    // Set up the query
    $query = "UPDATE mahasiswa
              SET nama = '$nama', prodi = '$prodi'
              WHERE nim = '$nim'";

    // Run the query and display appropriate message
    if(!$result = $connection->query($query)){
        echo "No rows updated<br />";
    }else{
        echo "Successfully updated<br />";
    }
}
```

Deleting Data in PHP (MySQLi)



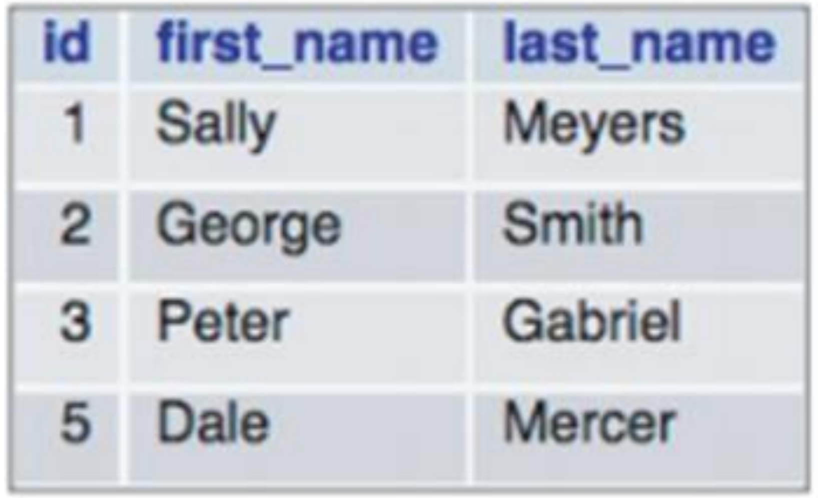
```php
// Make connection to database
$connection = new mysqli(HOSTNAME, MYSQLUSER, MYSQLPASS, MYSQLDB);
if($connection->connect_error){
    die('Connect Error: ' . $connection->connect_error);
}else{
    echo 'Successful connection to MySQL<br />';

    // Assign an id value for the test
    $id = 2;

    // Set up the query
    $query = "DELETE FROM mahasiswa WHERE id = $id";

    // Run the query and display appropriate message
    if(!$result = $connection->query($query)){
        echo "No rows deleted<br />";
    }else{
        echo $result . " row(s) successfully deleted<br />";
    }

}
```

Deleting Data in PHP (PDO)



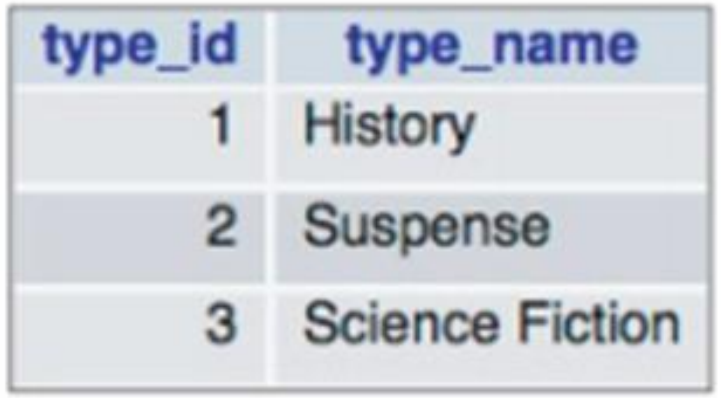
```php
<?php
define('MYSQLUSER', 'root');
define('MYSQLPASS', '');
define('HOSTNAME', 'localhost');
define('MYSQLDB', 'umn_genap2122_pemweb_w6');

// Set up the database connection
if($connection = new PDO('mysql:host='.HOSTNAME.';dbname='.MYSQLDB, MYSQLUSER, MYSQLPASS
    )){
    // Assign an id value for the test
    $id = 2;

    // Set up the query
    $query = "DELETE FROM mahasiswa WHERE id = $id";

    // Run the query and display appropriate message
    if(!$result = $connection->query($query)){
        echo "No rows deleted<br />";
    }else{
        echo "Successfully deleted<br />";
    }
}
```

Multiple Tables Manipulation



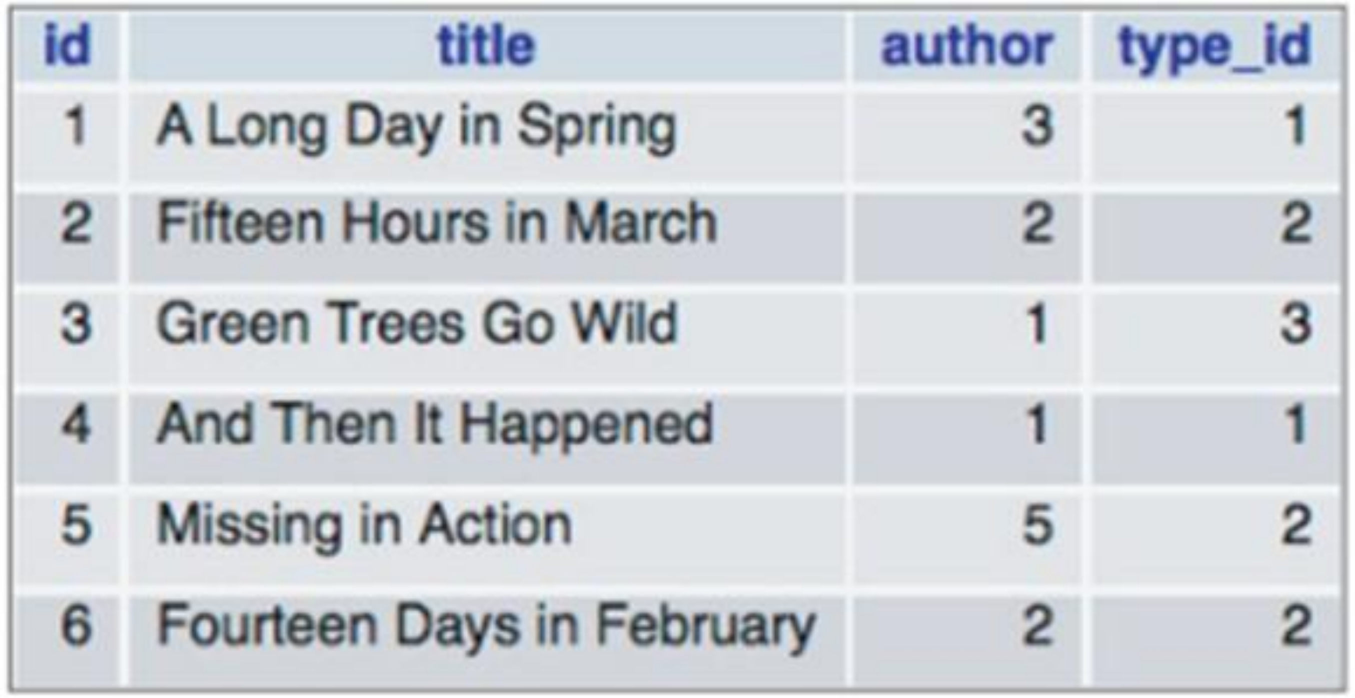
id	first_name	last_name
1	Sally	Meyers
2	George	Smith
3	Peter	Gabriel
5	Dale	Mercer

authors table



type_id	type_name
1	History
2	Suspense
3	Science Fiction

types table

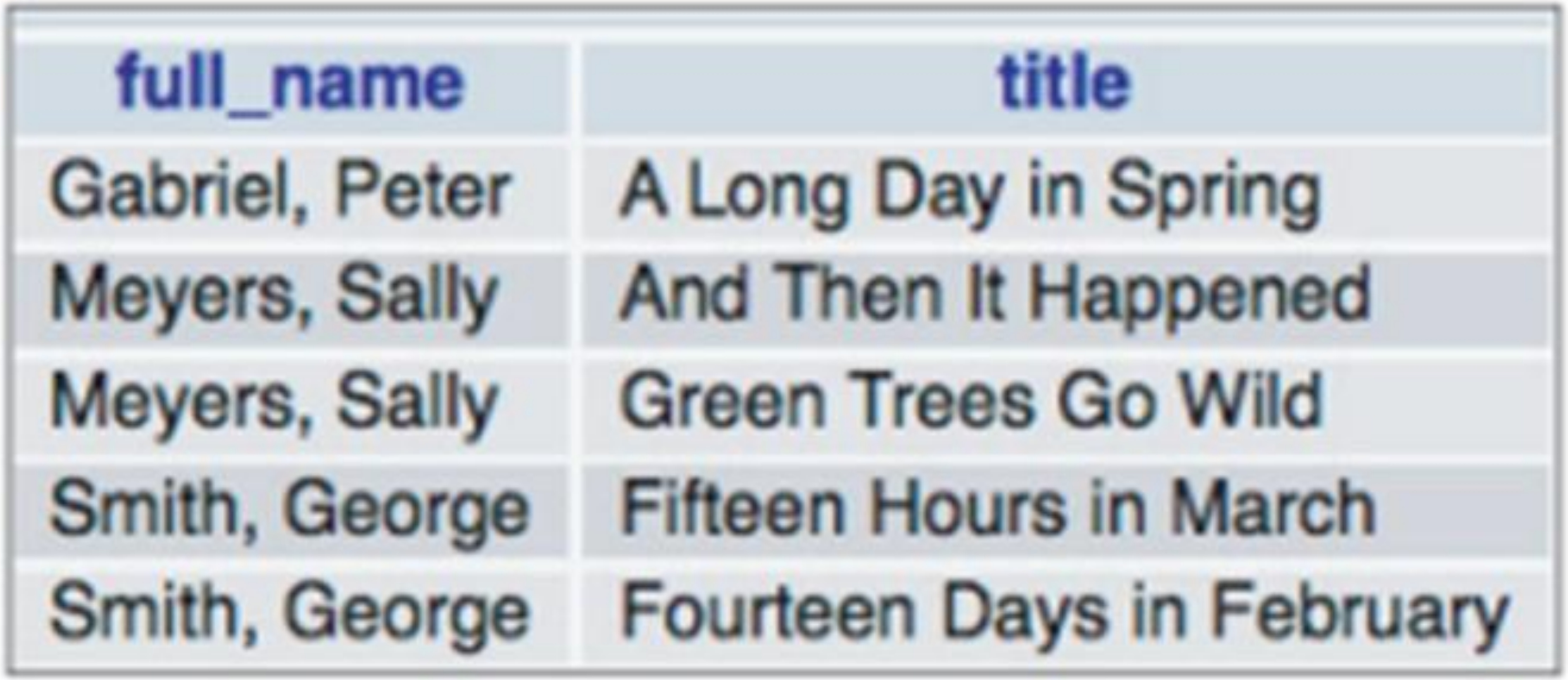


id	title	author	type_id
1	A Long Day in Spring	3	1
2	Fifteen Hours in March	2	2
3	Green Trees Go Wild	1	3
4	And Then It Happened	1	1
5	Missing in Action	5	2
6	Fourteen Days in February	2	2

books table

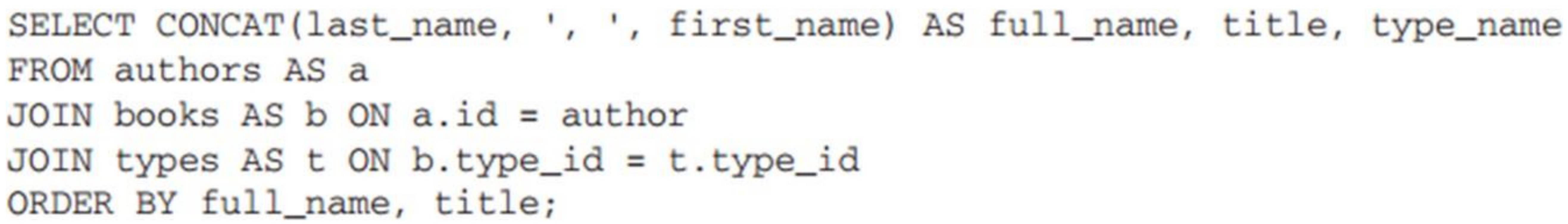
SQL Join

```
SELECT CONCAT(last_name, ', ', first_name) AS full_name, title
FROM authors AS a
JOIN books AS b ON a.id = author
ORDER BY full_name, title;;
```

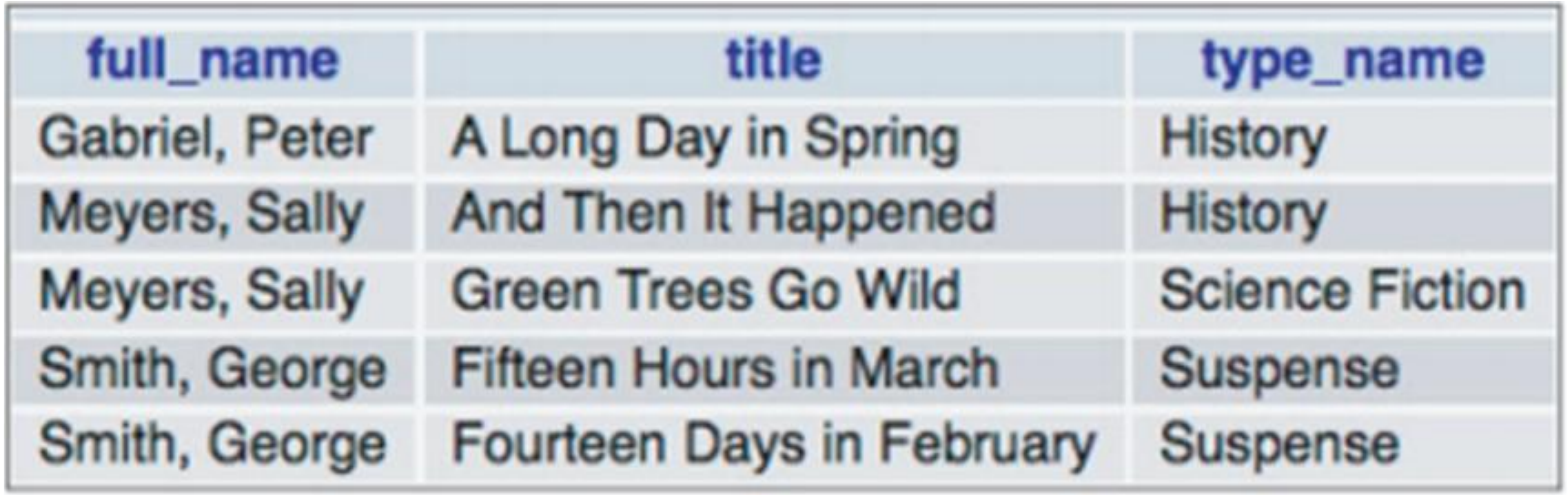


full_name	title
Gabriel, Peter	A Long Day in Spring
Meyers, Sally	And Then It Happened
Meyers, Sally	Green Trees Go Wild
Smith, George	Fifteen Hours in March
Smith, George	Fourteen Days in February

SQL Join - 3 fields

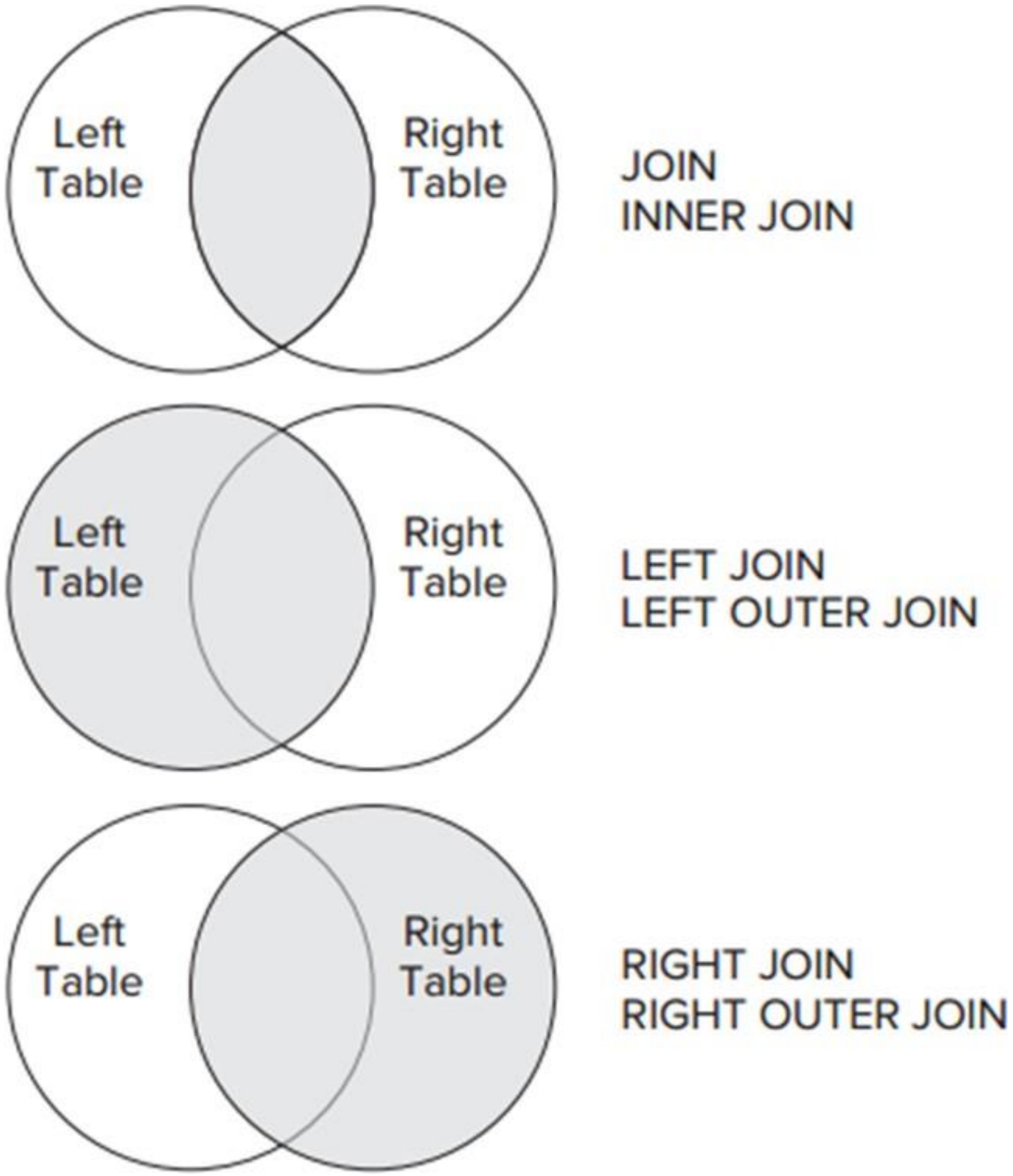


```
SELECT CONCAT(last_name, ', ', first_name) AS full_name, title, type_name
FROM authors AS a
JOIN books AS b ON a.id = author
JOIN types AS t ON b.type_id = t.type_id
ORDER BY full_name, title;
```

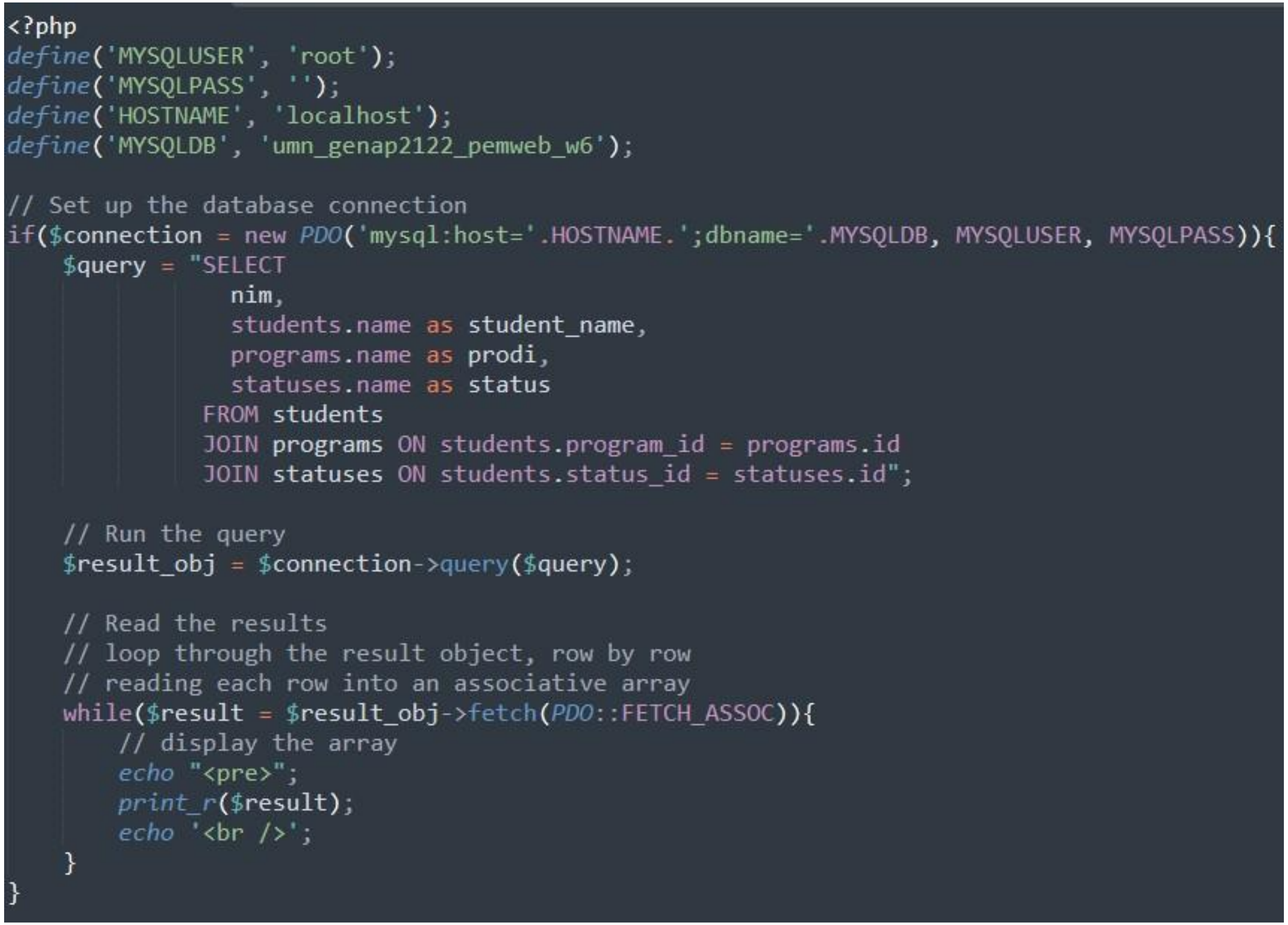


full_name	title	type_name
Gabriel, Peter	A Long Day in Spring	History
Meyers, Sally	And Then It Happened	History
Meyers, Sally	Green Trees Go Wild	Science Fiction
Smith, George	Fifteen Hours in March	Suspense
Smith, George	Fourteen Days in February	Suspense

Join Types


Left Table
Right Table
JOIN
INNER JOIN
Left Table
Right Table
LEFT JOIN
LEFT OUTER JOIN
Left Table
Right Table
RIGHT JOIN
RIGHT OUTER JOIN

Join Example



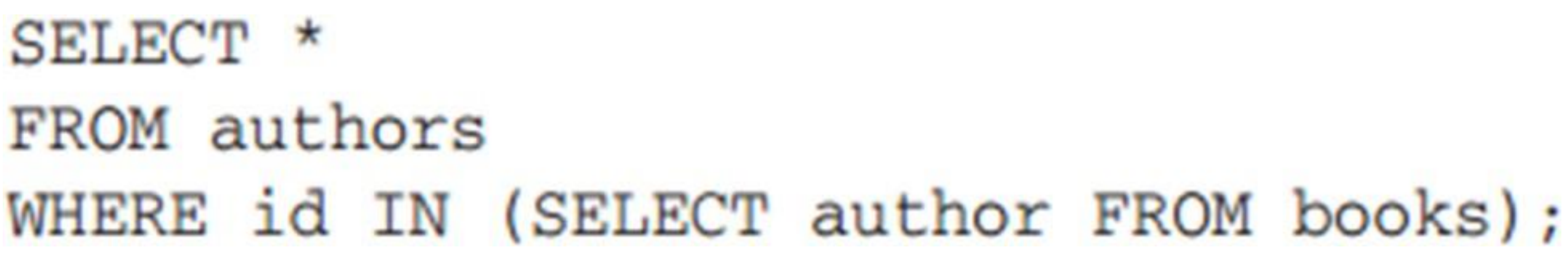
```
<?php
define('MYSQLUSER', 'root');
define('MYSQLPASS', '');
define('HOSTNAME', 'localhost');
define('MYSQLDB', 'umn_genap2122_pemweb_w6');

// Set up the database connection
if($connection = new PDO('mysql:host='.HOSTNAME.';dbname='.MYSQLDB, MYSQLUSER, MYSQLPASS)){
    $query = "SELECT
                nim,
                students.name as student_name,
                programs.name as prodi,
                statuses.name as status
              FROM students
              JOIN programs ON students.program_id = programs.id
              JOIN statuses ON students.status_id = statuses.id";

    // Run the query
    $result_obj = $connection->query($query);

    // Read the results
    // loop through the result object, row by row
    // reading each row into an associative array
    while($result = $result_obj->fetch(PDO::FETCH_ASSOC)){
        // display the array
        echo "<pre>";
        print_r($result);
        echo '<br />';
    }
}
```

Sub-Queries

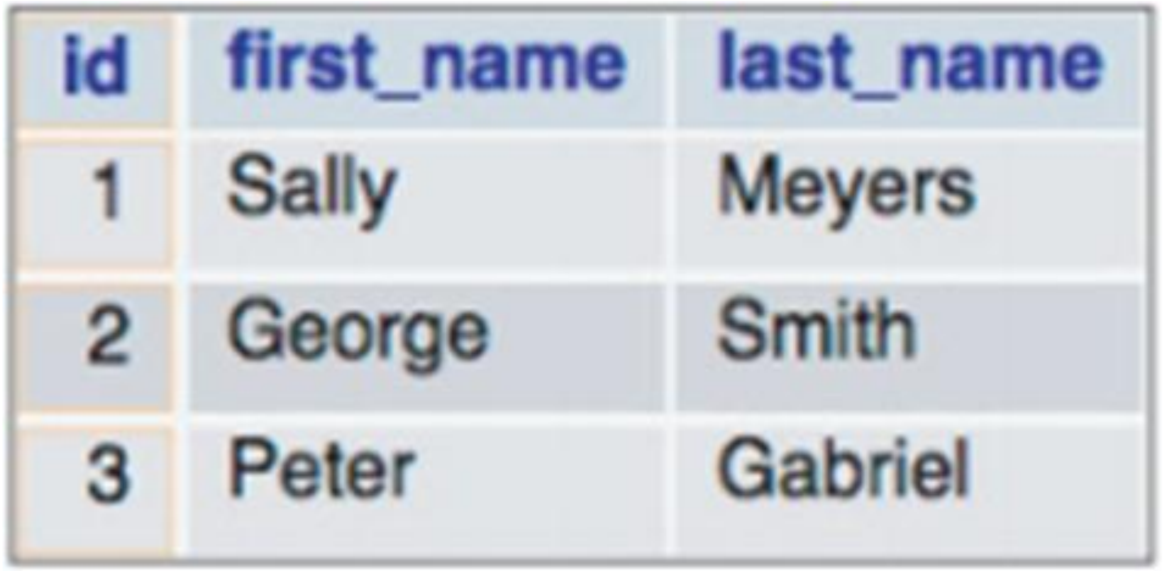
- Subqueries are SELECT statements nested inside other statements. These can be a handy substitute for JOIN and can, in some cases, do things that JOIN cannot.
- Large files → unexpected performance costs

Sub-Queries

- The WHERE filed IN list clause selects rows where the fields is found in the list. You can use SELECT statement in the preceding code to generate the list.



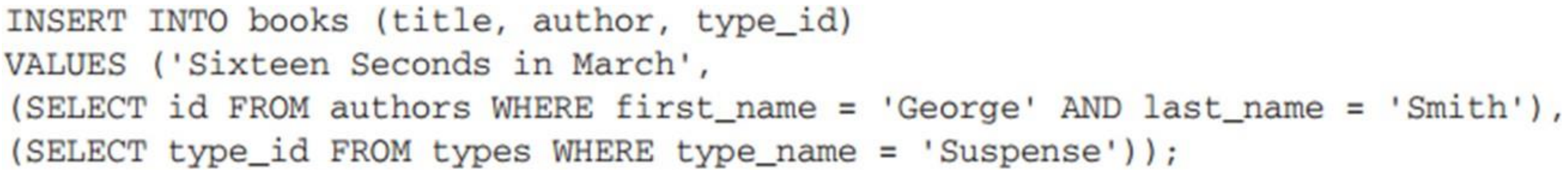
```
SELECT *
FROM authors
WHERE id IN (SELECT author FROM books);
```



id	first_name	last_name
1	Sally	Meyers
2	George	Smith
3	Peter	Gabriel

Sub-Queries

- You can use the subqueries in other statements, such as the INSERT statement. This example uses SELECT queries of other tables and uses the results as the values for creating a new row.



```
INSERT INTO books (title, author, type_id)
VALUES ('Sixteen Seconds in March',
(SELECT id FROM authors WHERE first_name = 'George' AND last_name = 'Smith'),
(SELECT type_id FROM types WHERE type_name = 'Suspense'));
```

SUMMARY

After finishing this module, you should be able:

- to understand what is database
- to understand how to design database
- to understand how to connect to database using PHP
- to understand how to manipulate data in the database
- to understand how to manipulate data in multiple table in the database

NEXT WEEK'S OUTLINE

- PHP Security
- String Encryption
- User Authentication

REFERENCES

- https://www.w3schools.com/PHP/default.asp
- https://www.php.net/docs.php
- Luke Welling & Laura Thomson. 2017. PHP and MySQL Web Development (5th ed)
- Robin Nixon. 2021. Learning PHp, MySQL & JavaScript.

Visi

Menjadi Program Studi Strata Satu Informatika **unggulan** yang menghasilkan lulusan **berwawasan internasional** yang **kompeten** di bidang Ilmu Komputer (*Computer Science*), **berjiwa wirausaha** dan **berbudi pekerti luhur**.

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Misi

1. Menyelenggarakan pembelajaran dengan teknologi dan kurikulum terbaik serta didukung tenaga pengajar profesional.
2. Melaksanakan kegiatan penelitian di bidang Informatika untuk memajukan ilmu dan teknologi Informatika.
3. Melaksanakan kegiatan pengabdian kepada masyarakat berbasis ilmu dan teknologi Informatika dalam rangka mengamalkan ilmu dan teknologi Informatika.