JavaScript implementation of MongoDB data models:

1. Project Setup

- **Install MongoDB:** Follow the instructions on the official website.
- **Install Node.js and npm:** Download and install Node.js from the official website. This includes npm (Node Package Manager).
- **Create a Project Directory:** Make a new directory for your project.
- **Initialize npm:** In your project directory, run `npm init -y` to create a `package.json` file.
- **Install MongoDB Driver:** Install the MongoDB driver for Node.js: `npm install mongodb`

2. Define Data Models (using JavaScript objects)

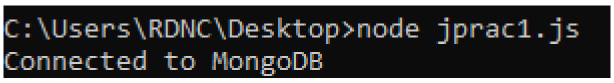
JavaScript

```
const studentSchema = {
  _id: { type: String, required: true }, // Using String for simplicity
  name: { type: String, required: true },
  age: { type: Number, min: 0 },
  grades: { type: Array, of: Number },
  courses: { type: Array, of: String }
};

const courseSchema = {
  _id: { type: String, required: true },
  name: { type: String, required: true },
  description: { type: String },
  instructor: { type: String }
};
```

3. Connect to MongoDB

JavaScript

```
const { MongoClient } = require('mongodb');

const uri = "mongodb://localhost:27017/"; // Replace with your connection string

const client = new MongoClient(uri);

async function run() {
  try {
    await client.connect();
    console.log('Connected to MongoDB');

    // ... your database operations here ...

  } finally {
    // Ensures that the client will close when you finish/error
    await client.close();
  }
}

run().catch(console.dir);
```

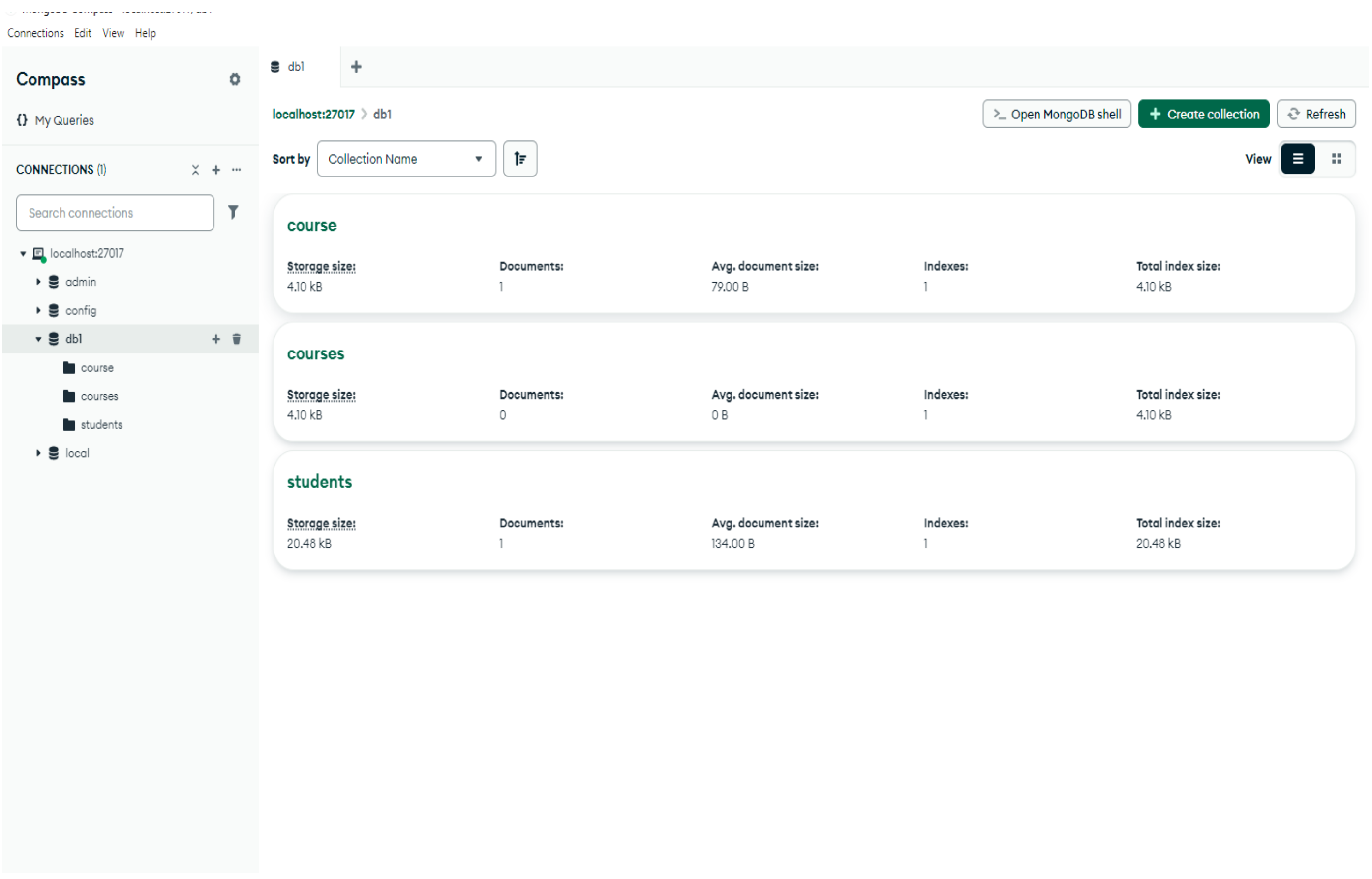


```
C:\Users\RDNC\Desktop>node jprac1.js
Connected to MongoDB
```

4. Create Collections

JavaScript

```
const db = client.db('your_database_name');
const studentsCollection = db.collection('students');
const coursesCollection = db.collection('courses');
```



course
Storage size: 4.10 kB   Documents: 1   Avg. document size: 79.00 B   Indexes: 1   Total index size: 4.10 kB

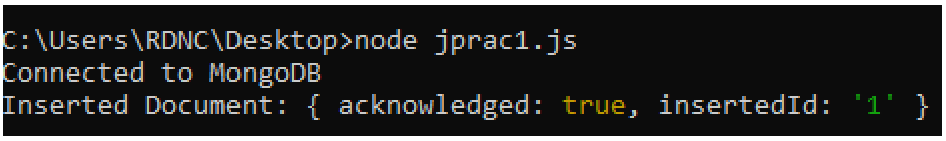
courses
Storage size: 4.10 kB   Documents: 0   Avg. document size: 0 B   Indexes: 1   Total index size: 4.10 kB

students
Storage size: 20.48 kB   Documents: 1   Avg. document size: 134.00 B   Indexes: 1   Total index size: 20.48 kB

5. Insert Data

JavaScript

```
const newStudent = {
  _id: '1',
  name: 'John Doe',
  age: 20,
  grades: [90, 85, 92],
  courses: ['Math', 'Science', 'History']
};

const result = await studentsCollection.insertOne(newStudent);
console.log('Inserted Document:', result);
```

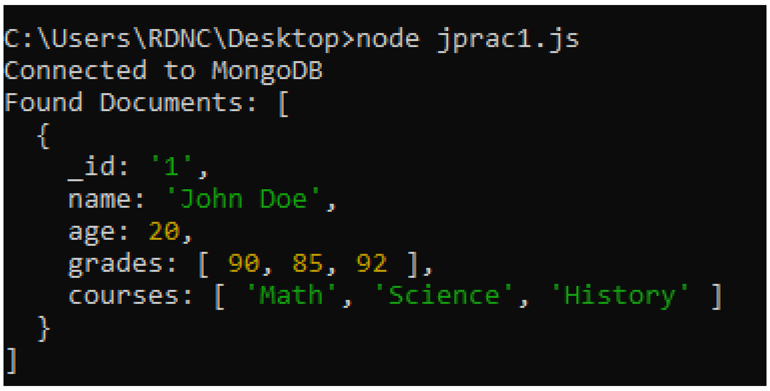


```
C:\Users\RDNC\Desktop>node jprac1.js
Connected to MongoDB
Inserted Document: { acknowledged: true, insertedId: '1' }
```

6. Read Data

JavaScript

```
const query = { age: { $gte: 20 } };
const cursor = studentsCollection.find(query);

const results = await cursor.toArray();
console.log('Found Documents:', results);
```

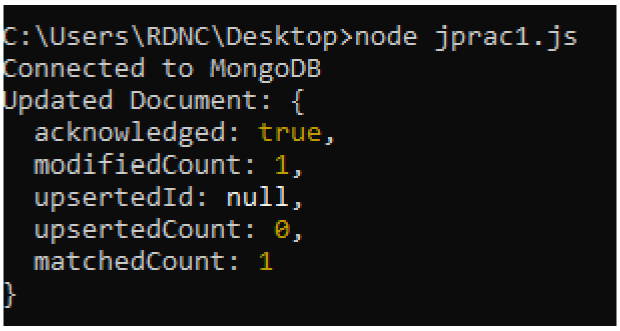


```
C:\Users\RDNC\Desktop>node jprac1.js
Connected to MongoDB
Found Documents: [
  {
    _id: '1',
    name: 'John Doe',
    age: 20,
    grades: [ 90, 85, 92 ],
    courses: [ 'Math', 'Science', 'History' ]
  }
]
```

7. Update Data

JavaScript

```
const filter = { name: 'John Doe' };
const updateDoc = {
  $set: { age: 21 }
};

const result = await studentsCollection.updateOne(filter, updateDoc);
console.log('Updated Document:', result);
```

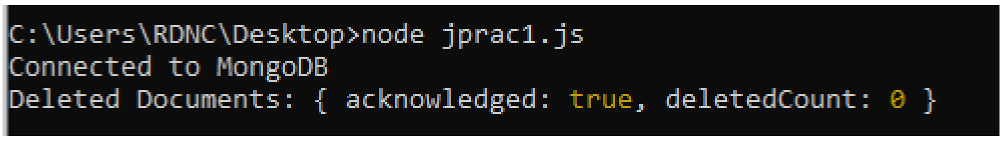


```
C:\Users\RDNC\Desktop>node jprac1.js
Connected to MongoDB
Updated Document: {
  acknowledged: true,
  modifiedCount: 1,
  upsertedId: null,
  upsertedCount: 0,
  matchedCount: 1
}
```

8. Delete Data

JavaScript

```
const query = { age: { $lt: 18 } };
const result = await studentsCollection.deleteMany(query);
console.log('Deleted Documents:', result);
```



```
C:\Users\RDNC\Desktop>node jprac1.js
Connected to MongoDB
Deleted Documents: { acknowledged: true, deletedCount: 0 }
```

9. Close Connection

- The connection is closed automatically in the `finally` block.

Tools and Notes for Students

- **MongoDB Compass:** Use the GUI for visualizing data and performing basic operations.
- **Node.js REPL:** Use the interactive console to experiment with code snippets.
- **Focus on:**
    - Data modeling principles.
    - CRUD operations.
    - Basic query operators (e.g., `$gt`, `$lt`, `$in`, `$regex`).
    - Data validation and sanitation.

Key Considerations

- **Error Handling:** Implement proper error handling to catch potential issues (e.g., connection errors, invalid data).
- **Asynchronous Operations:** Use `async/await` or promises to handle asynchronous operations effectively.
- **Security:** Always use appropriate security measures (e.g., authentication, authorization) to protect your MongoDB data.