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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

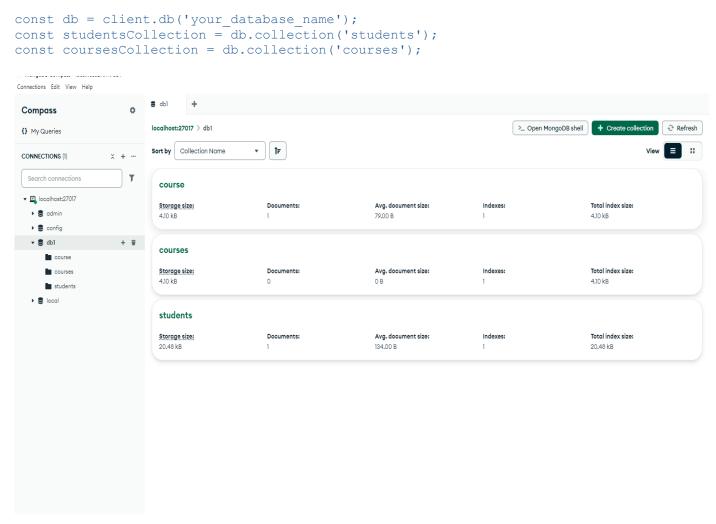
JavaScript

```
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);
```

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4. Create Collections

JavaScript



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' }
```

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6. Read Data

JavaScript

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

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

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 }
```

Advanced Application Development

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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.