

Chuyển students.txt về students.json sửa về format json

```
[
  {
    "_id": 1,
    "name": "Nguyễn Văn A",
    "age": 20,
    "gender": "Nam",
    "major": "Computer Science",
    "gpa": 3.5,
    "enrollmentDate": "2021-09-01",
    "courses": [
      { "courseId": "CS101", "courseName": "Introduction to Programming", "credits": 3, "grade": "B+" },
      { "courseId": "CS102", "courseName": "Data Structures", "credits": 4, "grade": "A-" }
    ]
  },
  {
    "_id": 2,
    "name": "Trần Thị B",
    "age": 22,
    "gender": "Nữ",
    "major": "Business Administration",
    "gpa": 3.8,
    "enrollmentDate": "2020-09-01",
    "courses": [
      { "courseId": "BA101", "courseName": "Principles of Management", "credits": 3, "grade": "A" },
      { "courseId": "BA102", "courseName": "Marketing Basics", "credits": 3, "grade": "B" }
    ]
  },
  {
```

```
"_id": 3,
"name": "Lê Văn C",
"age": 21,
"gender": "Nam",
"major": "Engineering",
"gpa": 3.2,
"enrollmentDate": "2022-01-15",
"courses": [
  { "courseId": "ENG101", "courseName": "Mechanics", "credits": 3, "grade": "C+" },
  { "courseId": "ENG102", "courseName": "Thermodynamics", "credits": 4, "grade": "B-" }
],
{
  "_id": 4,
  "name": "Phạm Thị D",
  "age": 19,
  "gender": "Nữ",
  "major": "Arts",
  "gpa": 3.9,
  "enrollmentDate": "2021-09-01",
  "courses": [
    { "courseId": "ART101", "courseName": "History of Art", "credits": 2, "grade": "A" },
    { "courseId": "ART102", "courseName": "Modern Art", "credits": 3, "grade": "A-" }
  ],
  {
    "_id": 5,
    "name": "Hoàng Văn E",
    "age": 23,
```

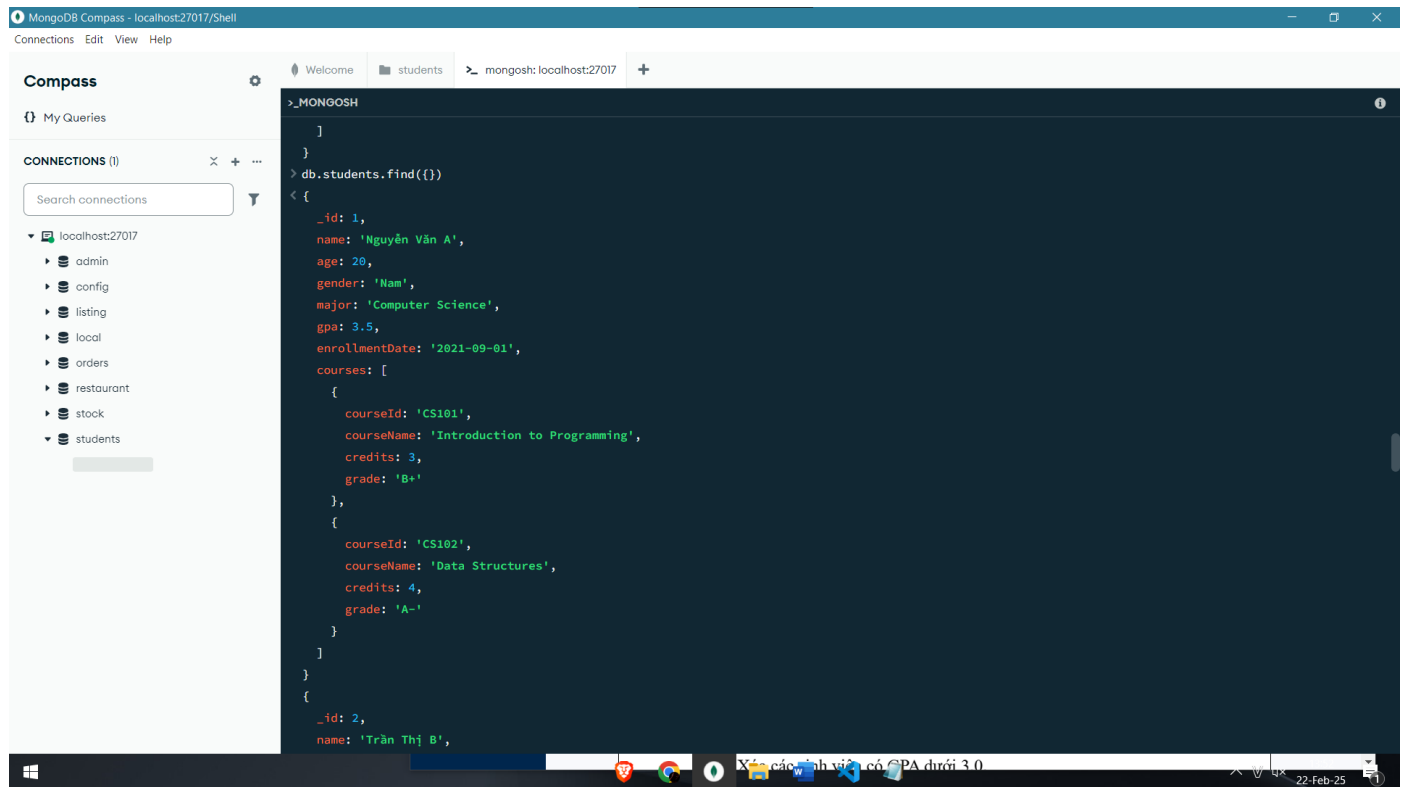
```
"gender": "Nam",
"major": "Mathematics",
"gpa": 3.7,
"enrollmentDate": "2019-09-01",
"courses": [
  { "courseId": "MATH101", "courseName": "Calculus I", "credits": 4, "grade": "A" },
  { "courseId": "MATH102", "courseName": "Linear Algebra", "credits": 3, "grade": "A-" },
  { "courseId": "MATH103", "courseName": "Probability", "credits": 3, "grade": "B+" }
],
{
  "_id": 6,
  "name": "Ngô Thị F",
  "age": 20,
  "gender": "Nữ",
  "major": "Biology",
  "gpa": 3.4,
  "enrollmentDate": "2021-09-01",
  "courses": [
    { "courseId": "BIO101", "courseName": "General Biology", "credits": 3, "grade": "B" },
    { "courseId": "BIO102", "courseName": "Genetics", "credits": 3, "grade": "B+" }
  ],
  {
    "_id": 7,
    "name": "Vũ Văn G",
    "age": 24,
    "gender": "Nam",
    "major": "Chemistry",
```

```
"gpa": 3.0,
"enrollmentDate": "2018-09-01",
"courses": [
  { "courseId": "CHEM101", "courseName": "Organic Chemistry", "credits": 4, "grade": "C" },
  { "courseId": "CHEM102", "courseName": "Inorganic Chemistry", "credits": 3, "grade": "B-" }
],
{
  "_id": 8,
  "name": "Bùi Thị H",
  "age": 22,
  "gender": "Nữ",
  "major": "Economics",
  "gpa": 3.6,
  "enrollmentDate": "2020-09-01",
  "courses": [
    { "courseId": "ECON101", "courseName": "Microeconomics", "credits": 3, "grade": "A-" },
    { "courseId": "ECON102", "courseName": "Macroeconomics", "credits": 3, "grade": "B+" }
  ],
  {
    "_id": 9,
    "name": "Đặng Văn I",
    "age": 21,
    "gender": "Nam",
    "major": "Physics",
    "gpa": 3.3,
    "enrollmentDate": "2021-09-01",
    "courses": [
```

```
{ "courseId": "PHY101", "courseName": "Mechanics", "credits": 3, "grade": "B+" },
{ "courseId": "PHY102", "courseName": "Electromagnetism", "credits": 4, "grade": "B" }
]
},
{
  "_id": 10,
  "name": "Trần Văn J",
  "age": 22,
  "gender": "Nam",
  "major": "Computer Science",
  "gpa": 3.9,
  "enrollmentDate": "2019-09-01",
  "courses": [
    { "courseId": "CS101", "courseName": "Introduction to Programming", "credits": 3, "grade": "A" },
    { "courseId": "CS103", "courseName": "Algorithms", "credits": 4, "grade": "A-" },
    { "courseId": "CS104", "courseName": "Operating Systems", "credits": 4, "grade": "B+" }
  ]
}
```

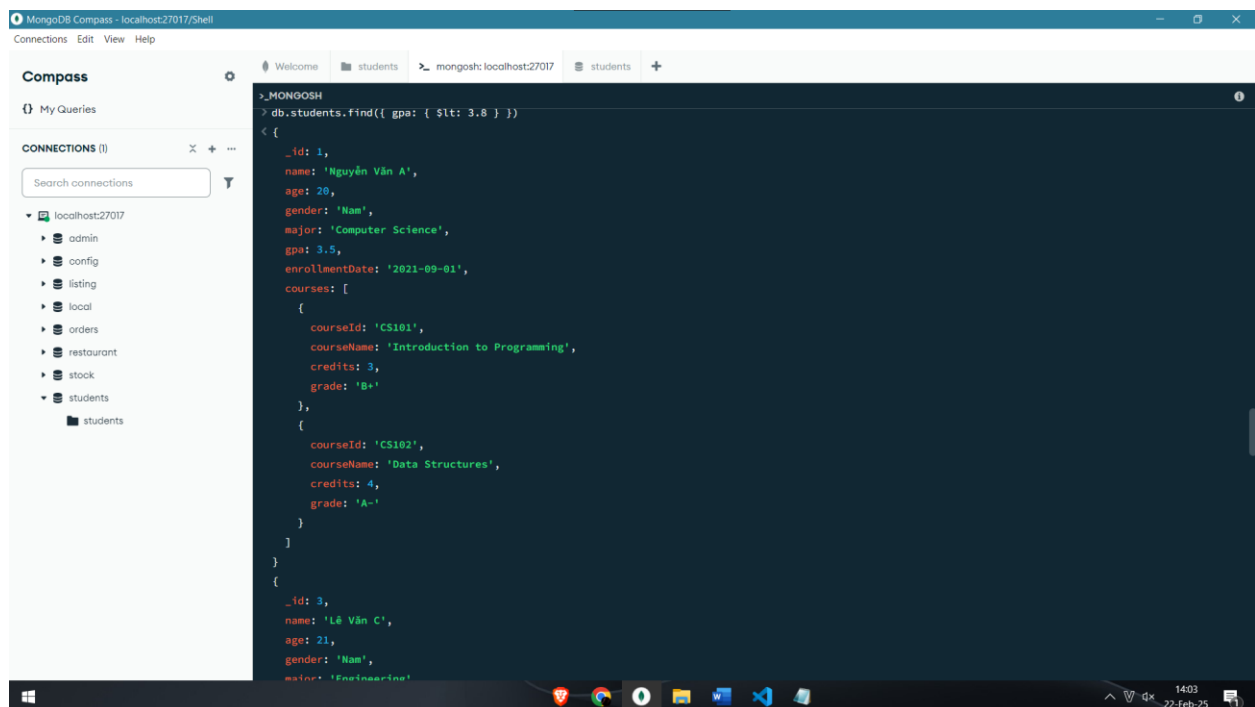
1. Lấy tất cả dữ liệu trong collection

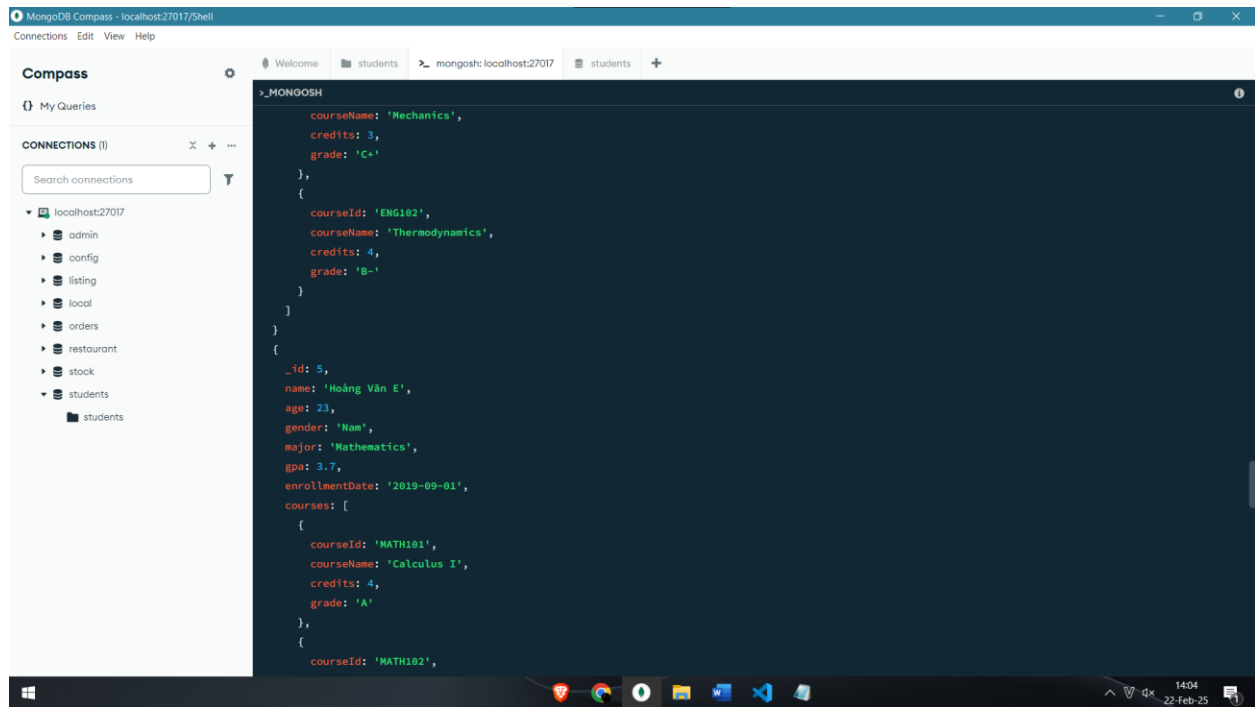
```
db.students.find({})
```



2. Tìm các sinh viên có GPA bé hơn 3.8

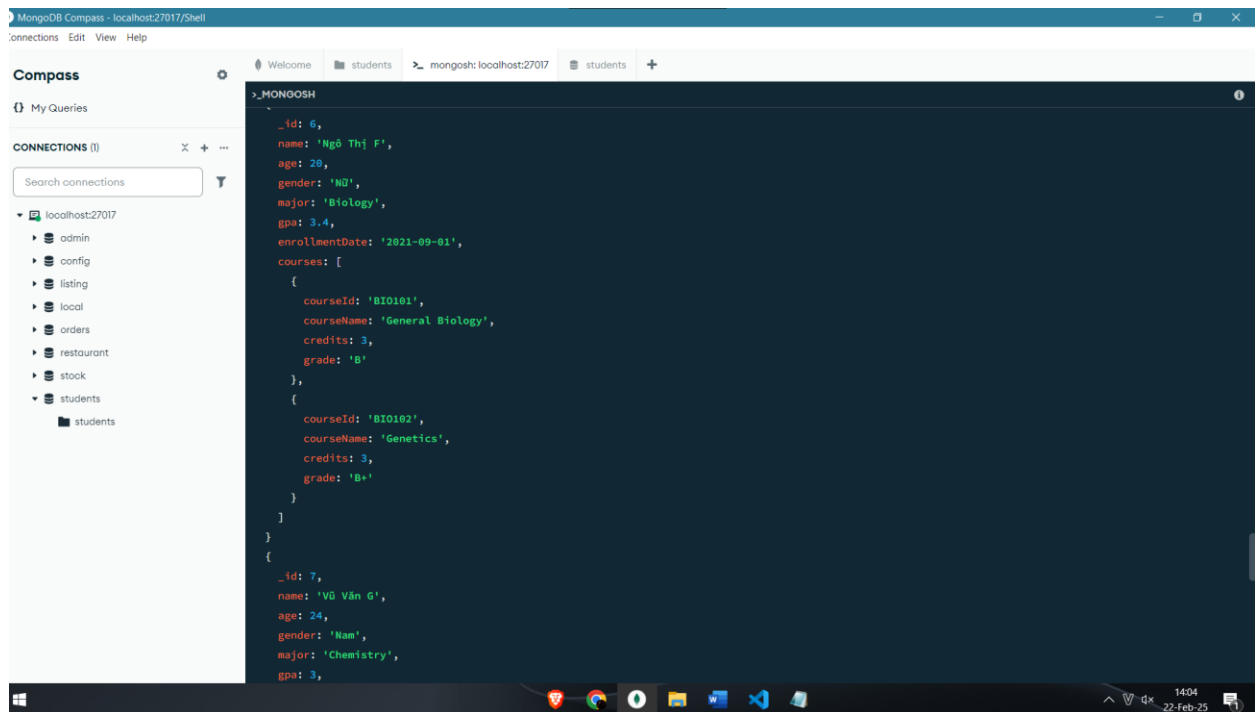
`db.students.find({ GPA: { $lt: 3.8 } })`





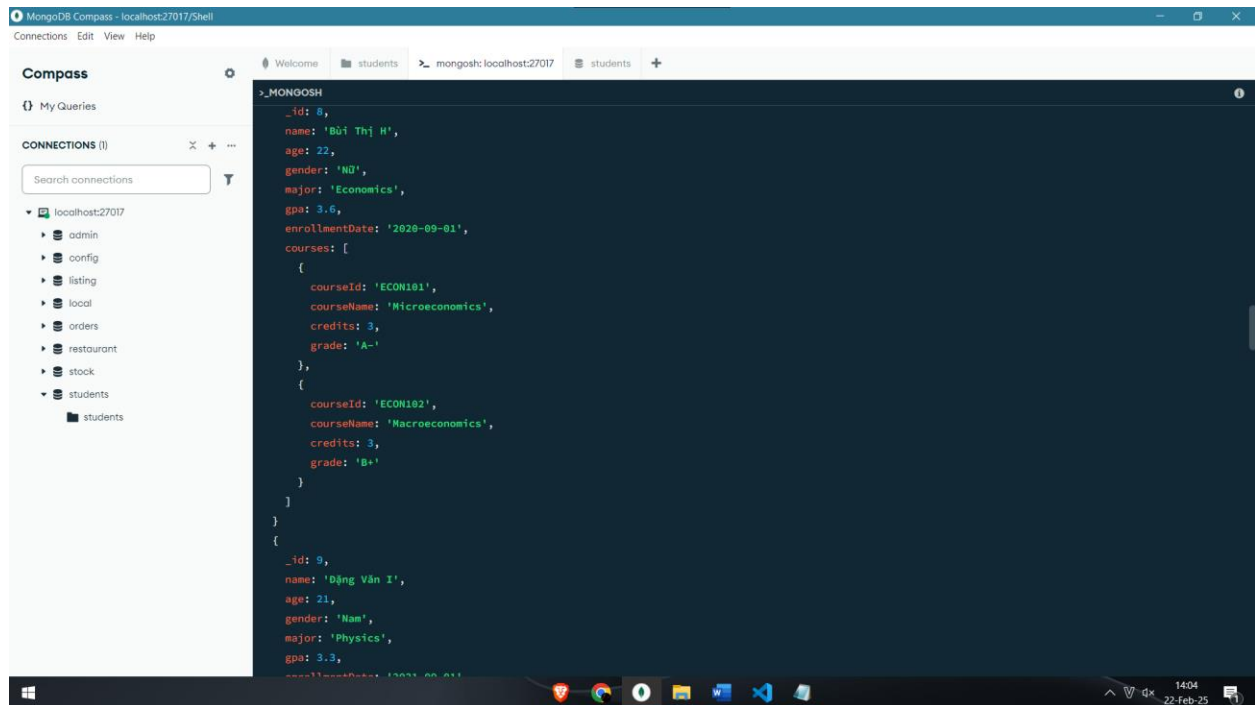
The screenshot shows the MongoDB Compass interface. The left sidebar displays the 'students' collection. The main window shows a document for a student with the following fields:

```
>_MONGOOSH
{
  "courseName": "Mechanics",
  "credits": 3,
  "grade": "C+"
},
{
  "courseId": "ENG102",
  "courseName": "Thermodynamics",
  "credits": 4,
  "grade": "B-"
}
]
{
  "_id": 5,
  "name": "Hoàng Văn E",
  "age": 23,
  "gender": "Nam",
  "major": "Mathematics",
  "gpa": 3.7,
  "enrollmentDate": "2019-09-01",
  "courses": [
    {
      "courseId": "MATH101",
      "courseName": "Calculus I",
      "credits": 4,
      "grade": "A"
    },
    {
      "courseId": "MATH102",
```



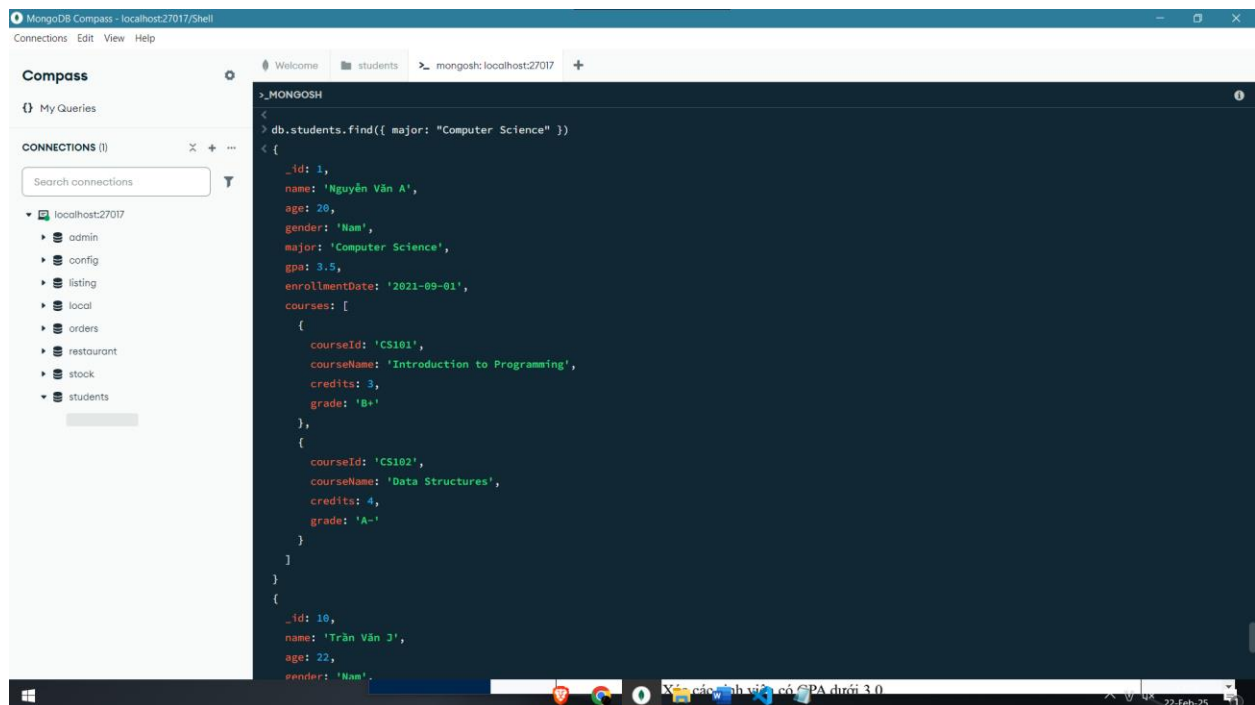
The screenshot shows the MongoDB Compass interface. The left sidebar displays the 'students' collection. The main window shows a document for a student with the following fields:

```
>_MONGOOSH
{
  "_id": 6,
  "name": "Ngô Thị F",
  "age": 28,
  "gender": "Nữ",
  "major": "Biology",
  "gpa": 3.4,
  "enrollmentDate": "2021-09-01",
  "courses": [
    {
      "courseId": "BIO101",
      "courseName": "General Biology",
      "credits": 3,
      "grade": "B"
    },
    {
      "courseId": "BIO102",
      "courseName": "Genetics",
      "credits": 3,
      "grade": "B+"
    }
  ]
}
{
  "_id": 7,
  "name": "Vũ Văn G",
  "age": 24,
  "gender": "Nam",
  "major": "Chemistry",
  "gpa": 3,
```



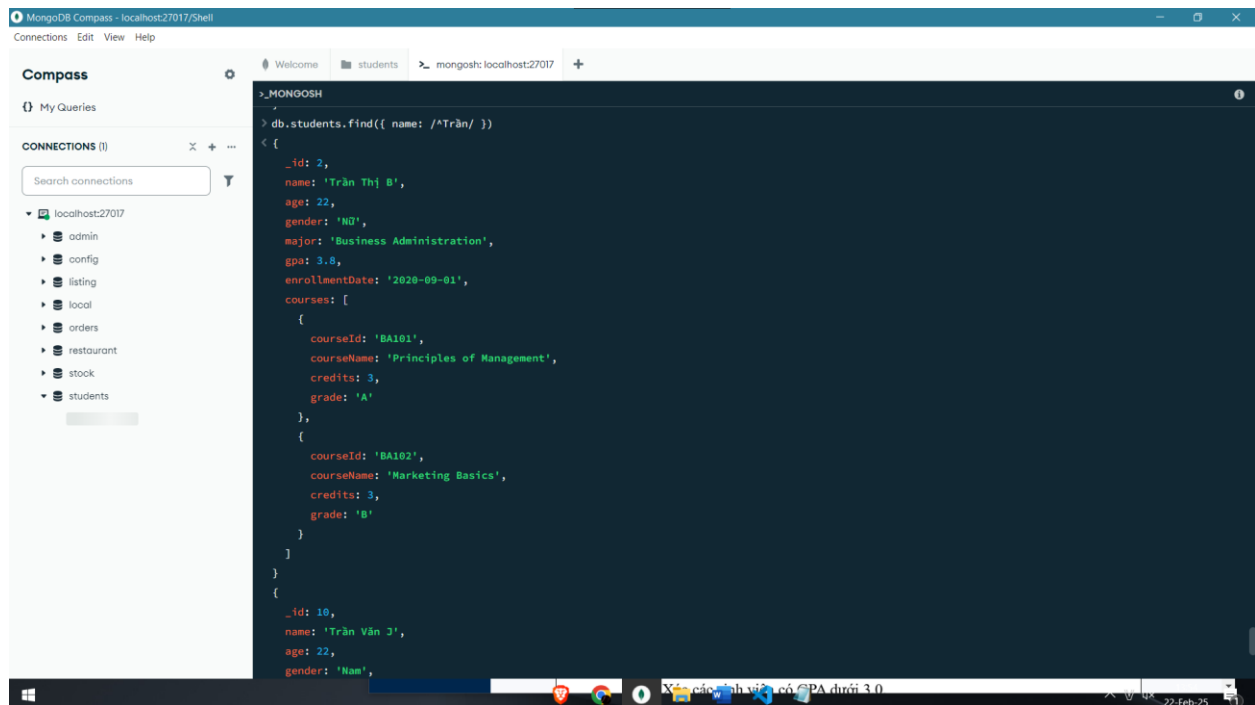
3. Tìm các sinh viên theo ngành "Computer Science"

`db.students.find({ major: "Computer Science" })`



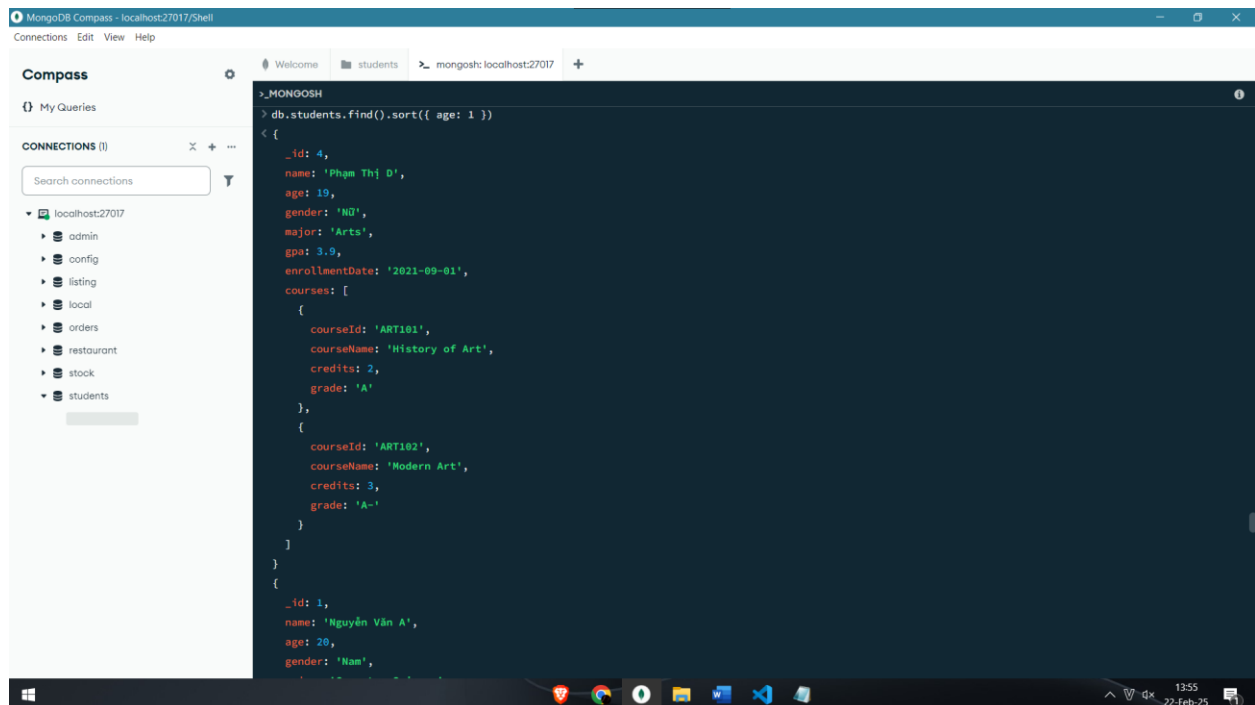
4. Tìm các sinh viên có tên bắt đầu bằng "Trần"

`db.students.find({ name: /^Trần/ })`



5. Sắp xếp các sinh viên theo tuổi tăng dần

`db.students.find().sort({ age: 1 })`



6. Đếm số lượng sinh viên theo giới tính (Nam/Nữ)

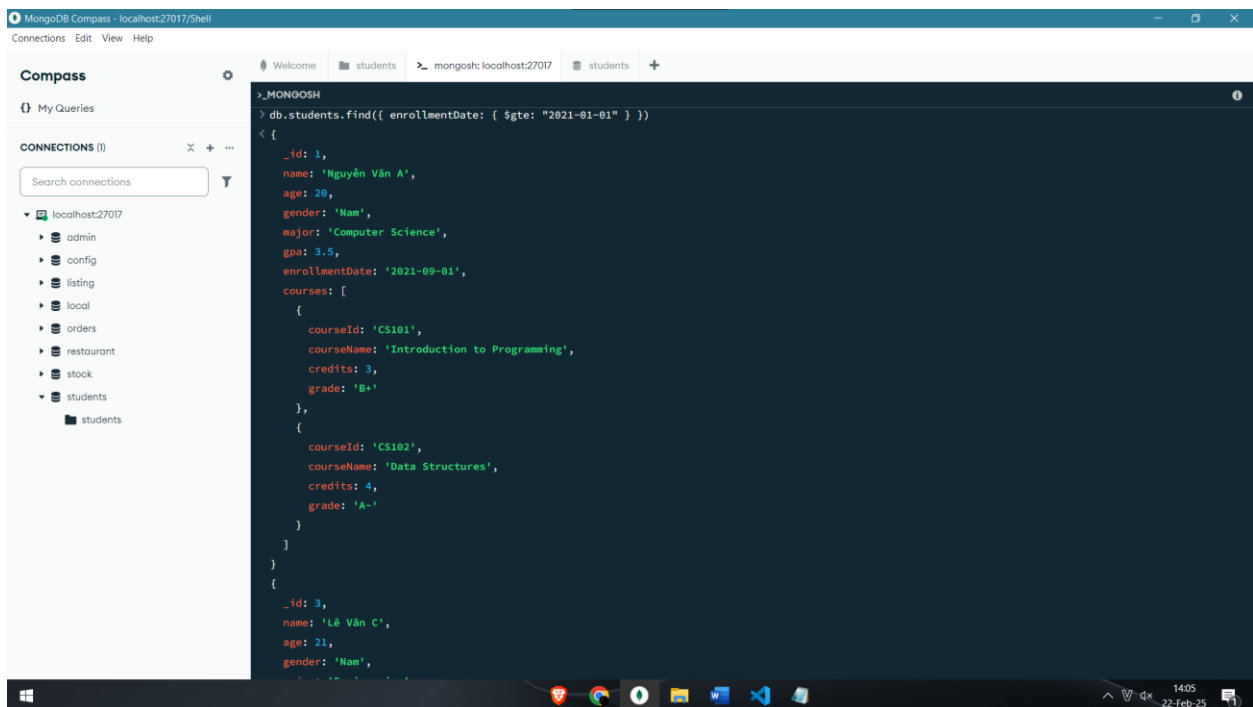
`db.students.aggregate([
 { $group: { _id: "$gender", count: { $sum: 1 } } }])`

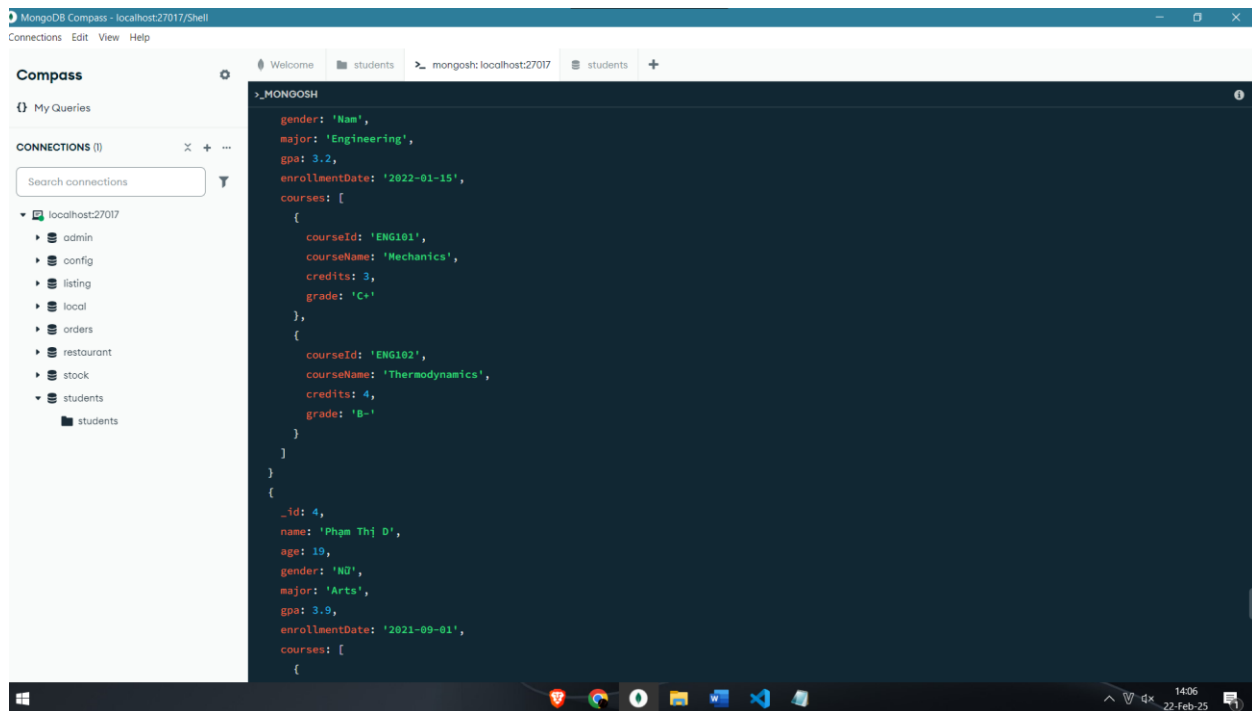
))

```
> db.students.aggregate([
  { $group: { _id: "$gender", count: { $sum: 1 } } }
])
< [
  {
    _id: 'Nam',
    count: 6
  },
  {
    _id: 'Nữ',
    count: 4
  }
]
students >
```

7. Tìm các sinh viên đăng ký từ năm 2021 trở đi

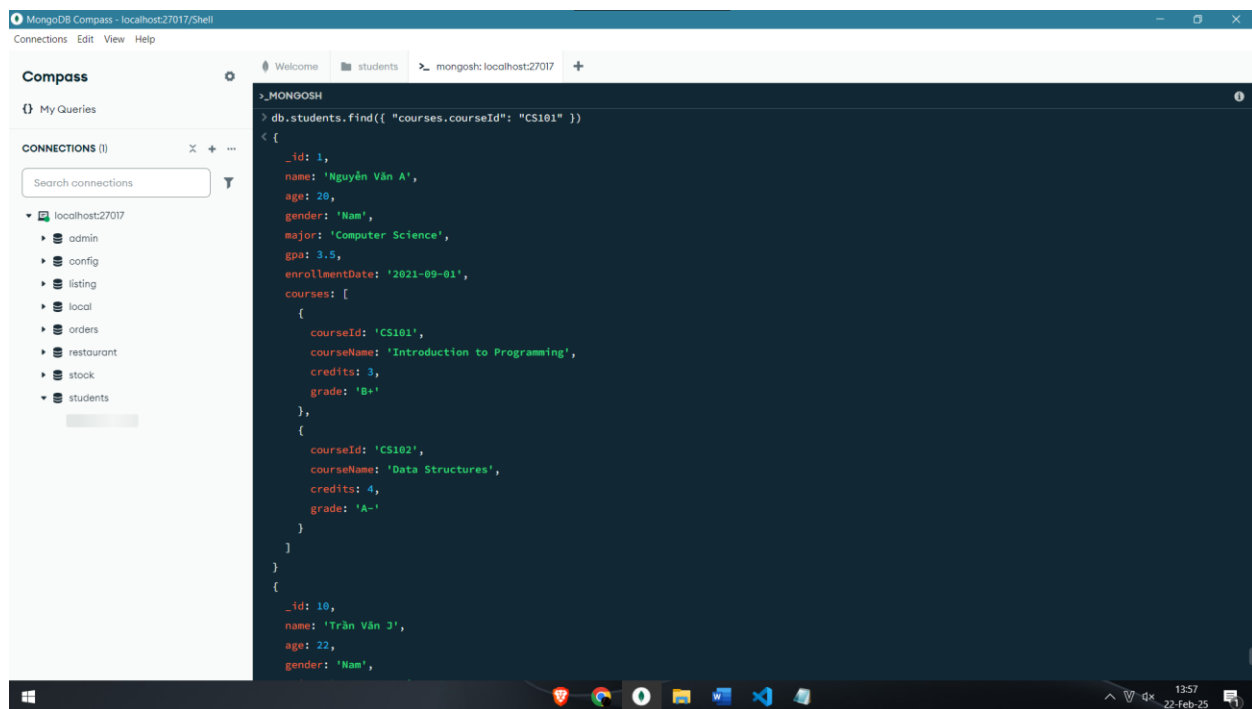
db.students.find({ enrollmentDate: { \$gte: "2021-01-01" } })





8. Tìm các sinh viên tham gia khóa học có courseId là "CS101"

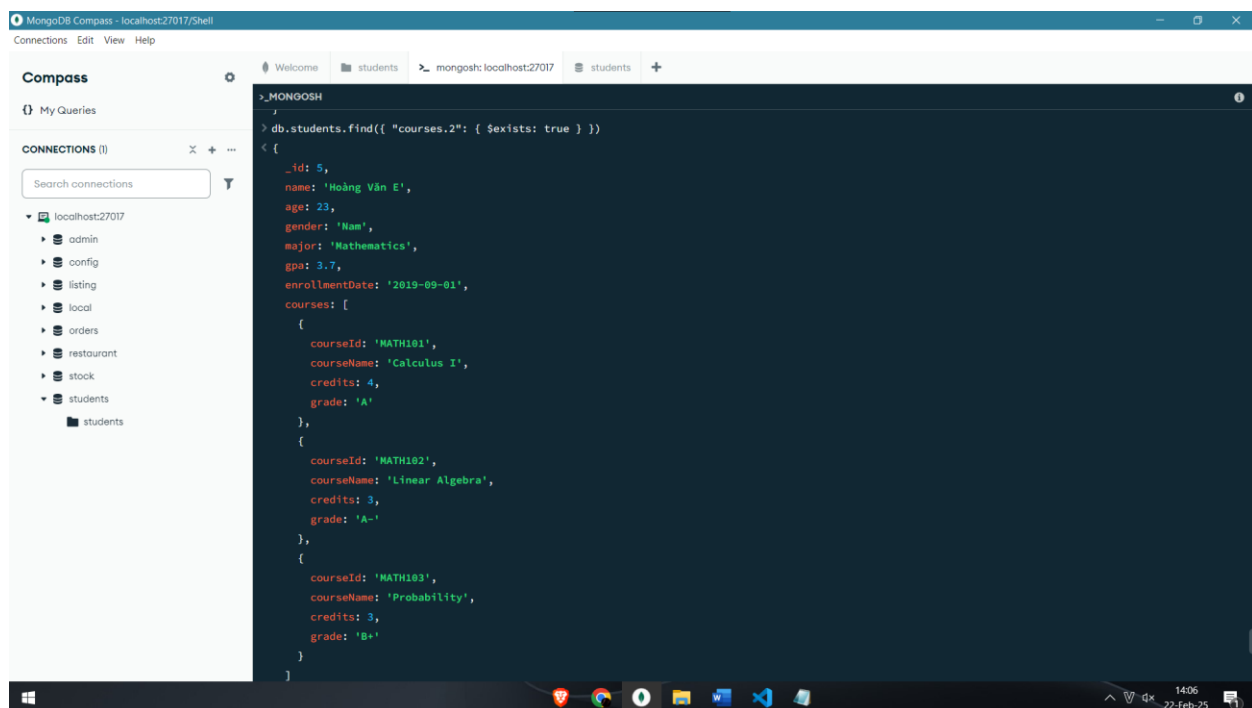
db.students.find({ "courses.courseId": "CS101" })

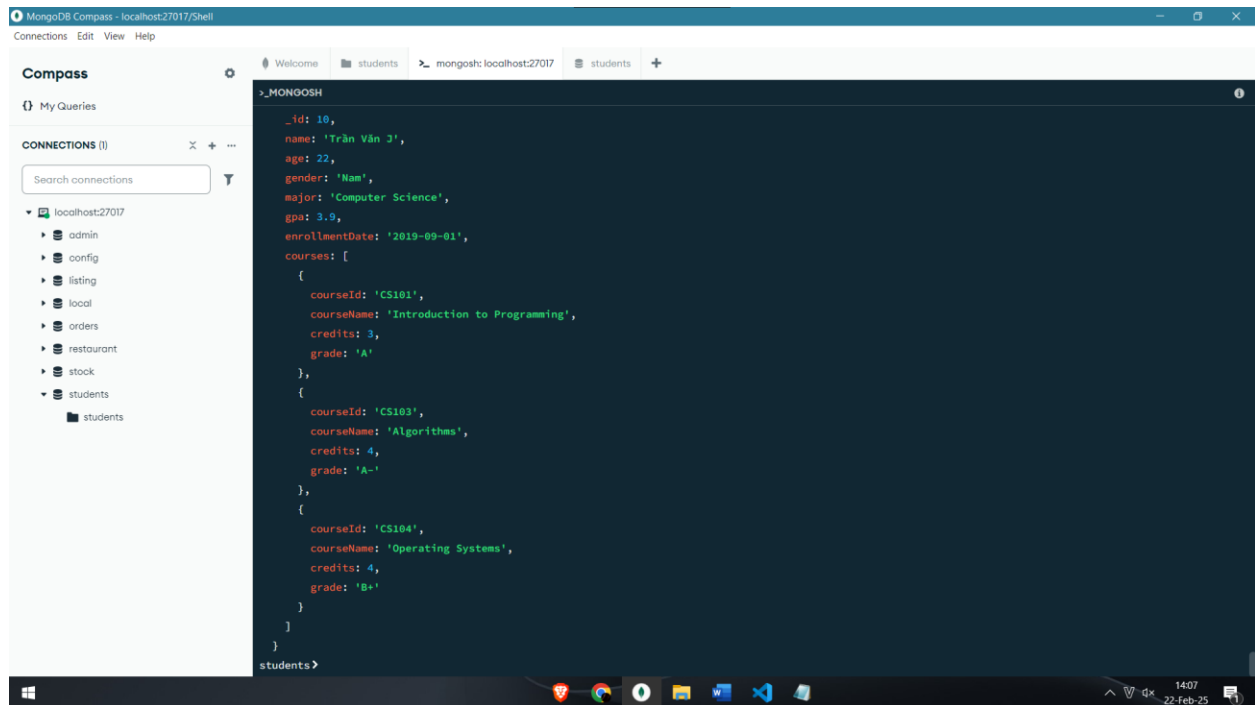


```
gpa: 3.9,  
enrollmentDate: '2019-09-01',  
courses: [  
  {  
    courseId: 'CS101',  
    courseName: 'Introduction to Programming',  
    credits: 3,  
    grade: 'A'  
  },  
  {  
    courseId: 'CS103',  
    courseName: 'Algorithms',  
    credits: 4,  
    grade: 'A-'  
  }  
]
```

9. Tìm các sinh viên đăng ký ít nhất 3 khóa học

`db.students.find({ "courses.2": { $exists: true } })`





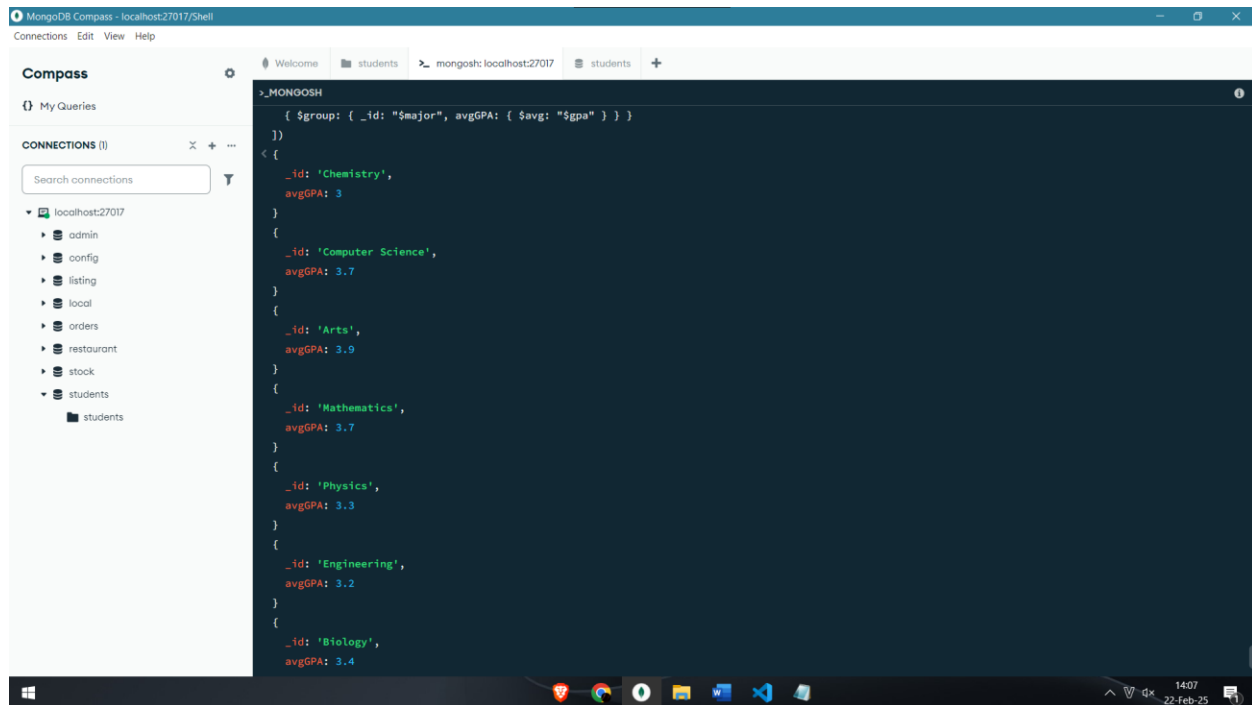
10. Tìm sinh viên có GPA thấp nhất

`db.students.find().sort({ gpa: 1 }).limit(1)`

```
> db.students.find().sort({ gpa: 1 }).limit(1)
< {
  _id: 7,
  name: 'Vũ Văn G',
  age: 24,
  gender: 'Nam',
  major: 'Chemistry',
  gpa: 3,
  enrollmentDate: '2018-09-01',
  courses: [
    {
      courseId: 'CHEM101',
      courseName: 'Organic Chemistry',
      credits: 4,
      grade: 'C'
    },
    {
      courseId: 'CHEM102',
      courseName: 'Inorganic Chemistry',
      credits: 3,
      grade: 'B-'
    }
  ]
}
```

11. Tính GPA trung bình của các sinh viên theo ngành học

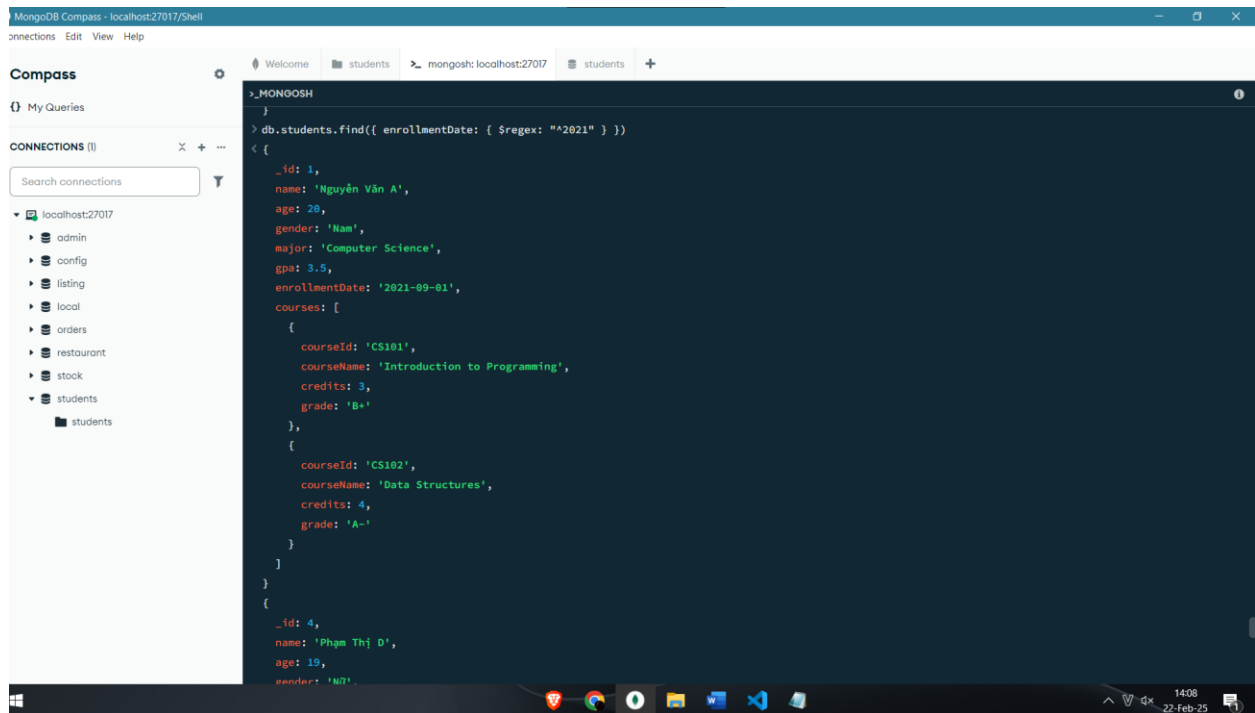
```
db.students.aggregate([
  { $group: { _id: "$major", avgGPA: { $avg: "$gpa" } } }
])
```



```
{
  _id: 'Economics',
  avgGPA: 3.6
}
{
  _id: 'Business Administration',
  avgGPA: 3.8
}
```

12. Tìm các sinh viên đăng ký trong năm 2021

db.students.find({ enrollmentDate: { \$regex: "^2021" } })

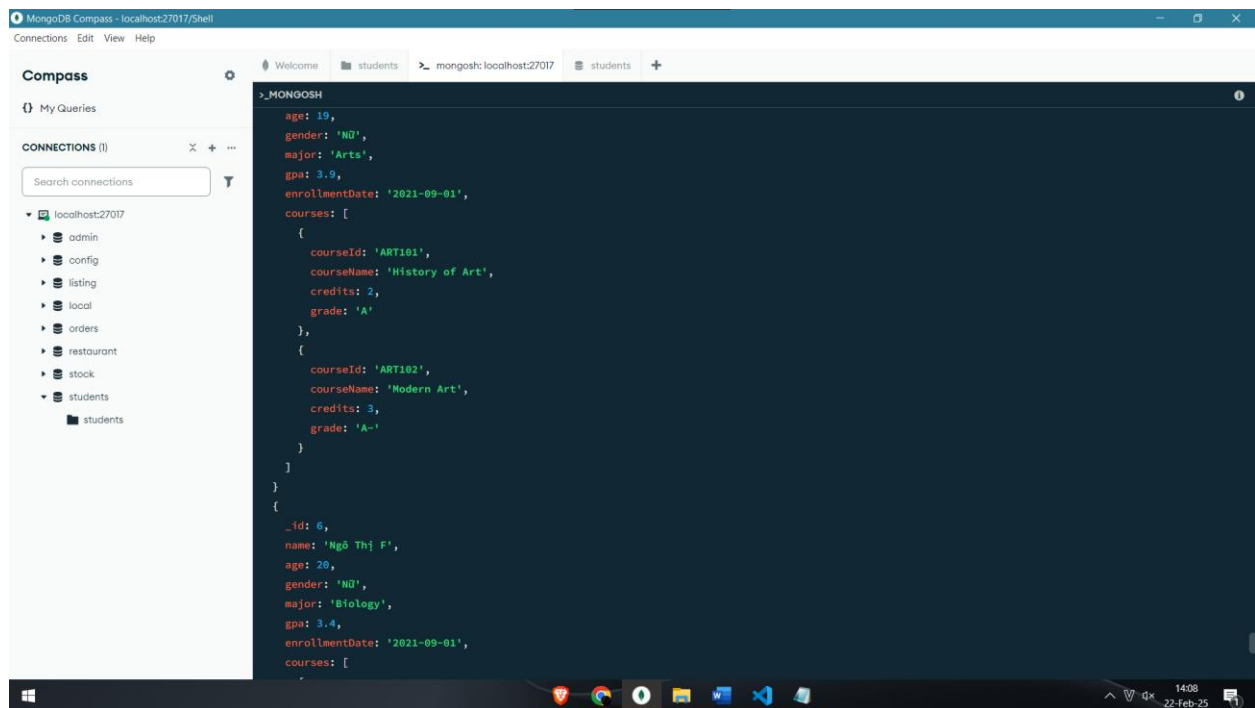


The screenshot shows the MongoDB Compass interface. The left sidebar displays the 'students' collection. The main window shows a MongoDB shell session with the following query and results:

```
> db.students.find({ enrollmentDate: { $regex: ""2021" } })
```

```
{
  "_id": 1,
  "name": "Nguyễn Văn A",
  "age": 20,
  "gender": "Nam",
  "major": "Computer Science",
  "gpa": 3.5,
  "enrollmentDate": "2021-09-01",
  "courses": [
    {
      "courseId": "CS101",
      "courseName": "Introduction to Programming",
      "credits": 3,
      "grade": "B+"
    },
    {
      "courseId": "CS102",
      "courseName": "Data Structures",
      "credits": 4,
      "grade": "A-"
    }
  ]
}
```

```
{
  "_id": 4,
  "name": "Phạm Thị D",
  "age": 19,
  "gender": "Nữ"
}
```

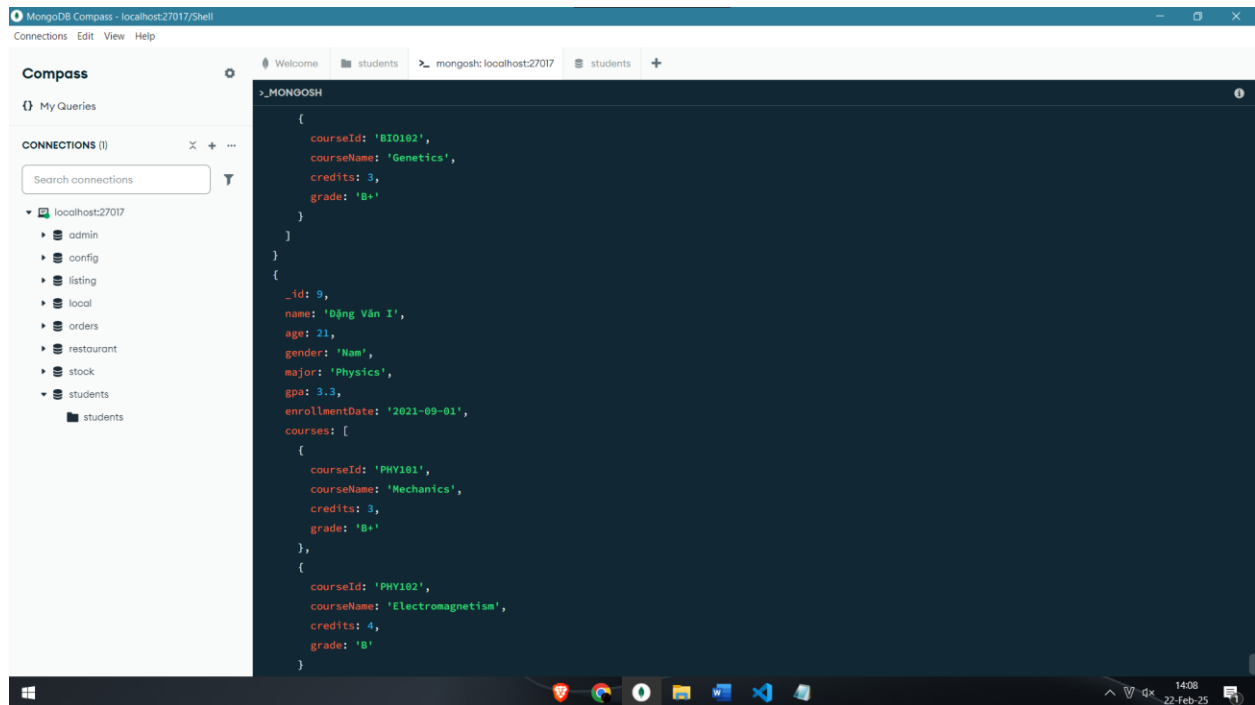


The screenshot shows the MongoDB Compass interface. The left sidebar displays the 'students' collection. The main window shows a MongoDB shell session with the following query and results:

```
> db.students.find({ enrollmentDate: { $regex: ""2021" } })
```

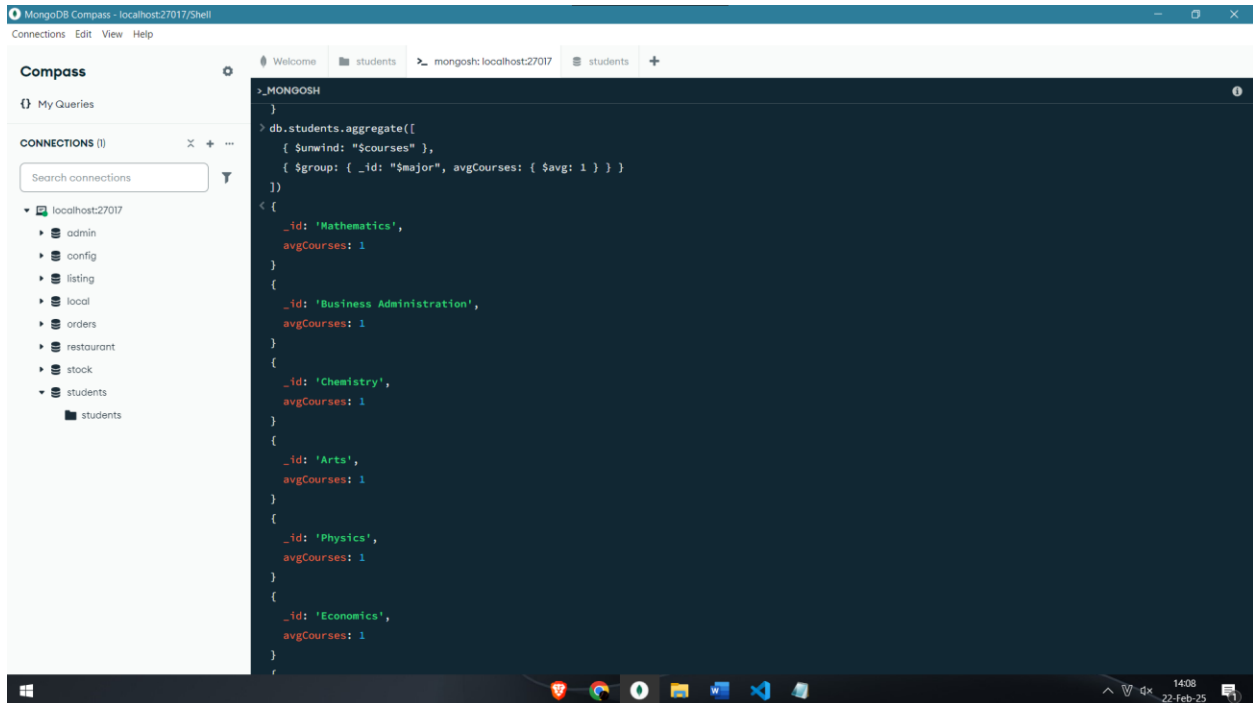
```
{
  "age": 19,
  "gender": "Nữ",
  "major": "Arts",
  "gpa": 3.9,
  "enrollmentDate": "2021-09-01",
  "courses": [
    {
      "courseId": "ART101",
      "courseName": "History of Art",
      "credits": 2,
      "grade": "A"
    },
    {
      "courseId": "ART102",
      "courseName": "Modern Art",
      "credits": 3,
      "grade": "A-"
    }
  ]
}
```

```
{
  "_id": 6,
  "name": "Ngô Thị F",
  "age": 20,
  "gender": "Nữ",
  "major": "Biology",
  "gpa": 3.4,
  "enrollmentDate": "2021-09-01",
  "courses": [
    {
      "courseId": "BIO101",
      "courseName": "Cell Biology",
      "credits": 3,
      "grade": "B+"
    },
    {
      "courseId": "BIO102",
      "courseName": "Genetics",
      "credits": 4,
      "grade": "A-"
    }
  ]
}
```



13. Tính số lượng khóa học trung bình của các sinh viên theo ngành học

```
db.students.aggregate([  
  { $unwind: "$courses" },  
  { $group: { _id: "$major", avgCourses: { $avg: 1 } } }  
])
```

14. Cập nhật tăng GPA thêm 0.1 cho tất cả sinh viên ngành "Computer Science"

```
db.students.updateMany(
  { major: "Computer Science" },
  { $inc: { gpa: 0.1 } }
)
```

```
> db.students.updateMany(
  { major: "Computer Science" },
  { $inc: { gpa: 0.1 } }
)
< {
  acknowledged: true,
  insertedId: null,
  matchedCount: 2,
  modifiedCount: 2,
  upsertedCount: 0
}
```

15. Xóa các sinh viên có GPA dưới 3.0

db.students.deleteMany({ gpa: { \$lt: 3.0 } })

```
> db.students.deleteMany({ gpa: { $lt: 3.0 } })
< {
  acknowledged: true,
  deletedCount: 0
}
```

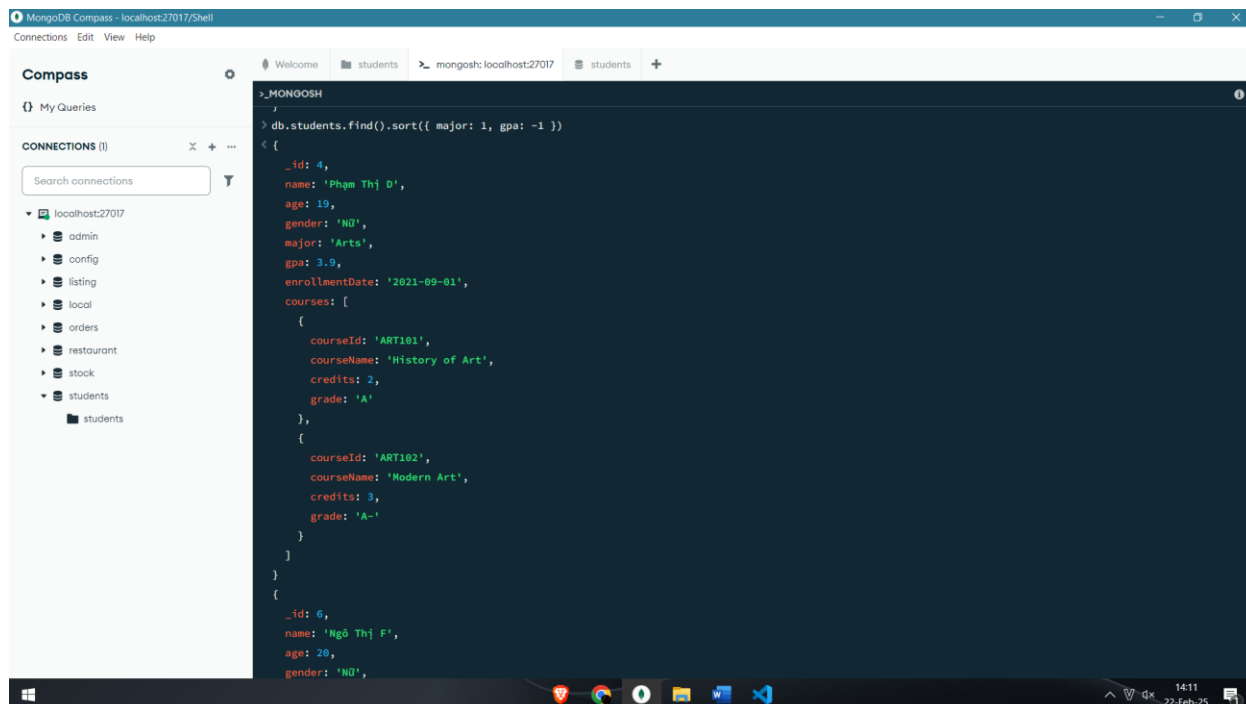
16. Tìm các sinh viên đăng ký khóa học có tên "Calculus I"

db.students.find({ "courses.courseName": "Calculus I" })

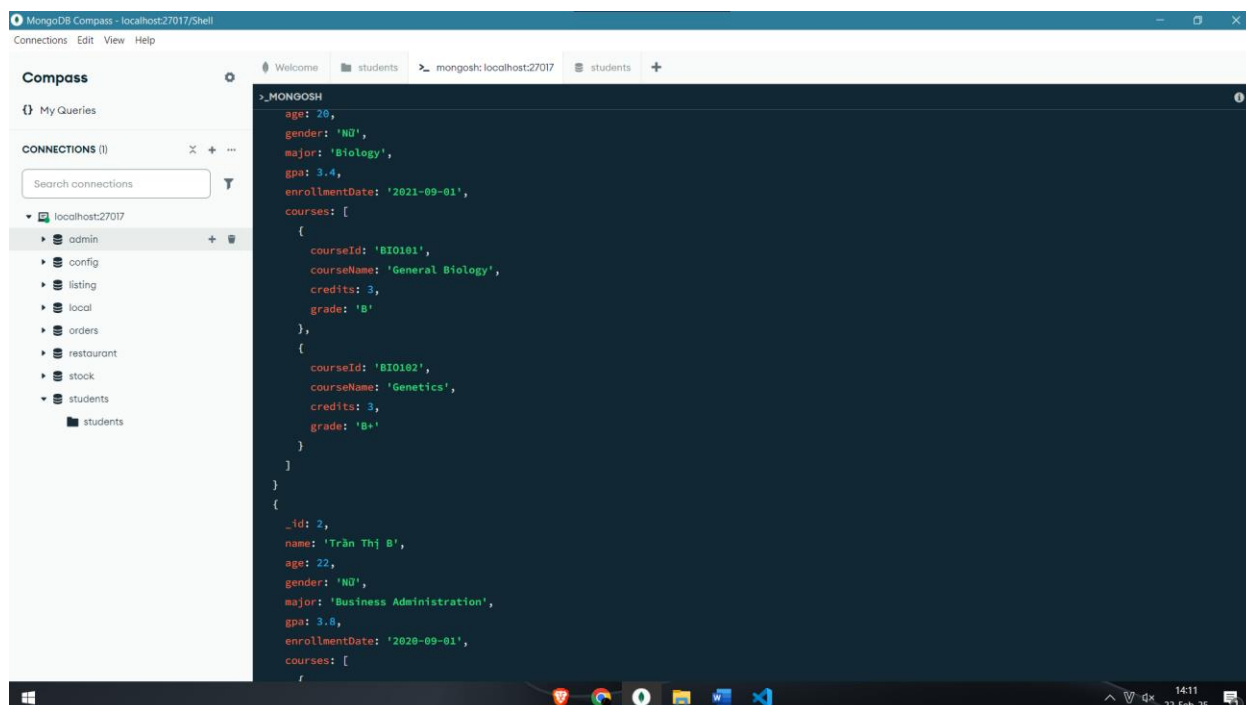
```
> db.students.find({ "courses.courseName": "Calculus I" })
< {
  _id: 5,
  name: 'Hoàng Văn E',
  age: 23,
  gender: 'Nam',
  major: 'Mathematics',
  gpa: 3.7,
  enrollmentDate: '2019-09-01',
  courses: [
    {
      courseId: 'MATH101',
      courseName: 'Calculus I',
      credits: 4,
      grade: 'A'
    },
    {
      courseId: 'MATH102',
      courseName: 'Linear Algebra',
      credits: 3,
      grade: 'A-'
    },
    {
      courseId: 'MATH103',
      courseName: 'Probability',
      credits: 3,
      grade: 'B+'
    }
  ]
}
```

17. Sắp xếp các sinh viên theo ngành học, sau đó theo GPA giảm dần

`db.students.find().sort({ major: 1, gpa: -1 })`



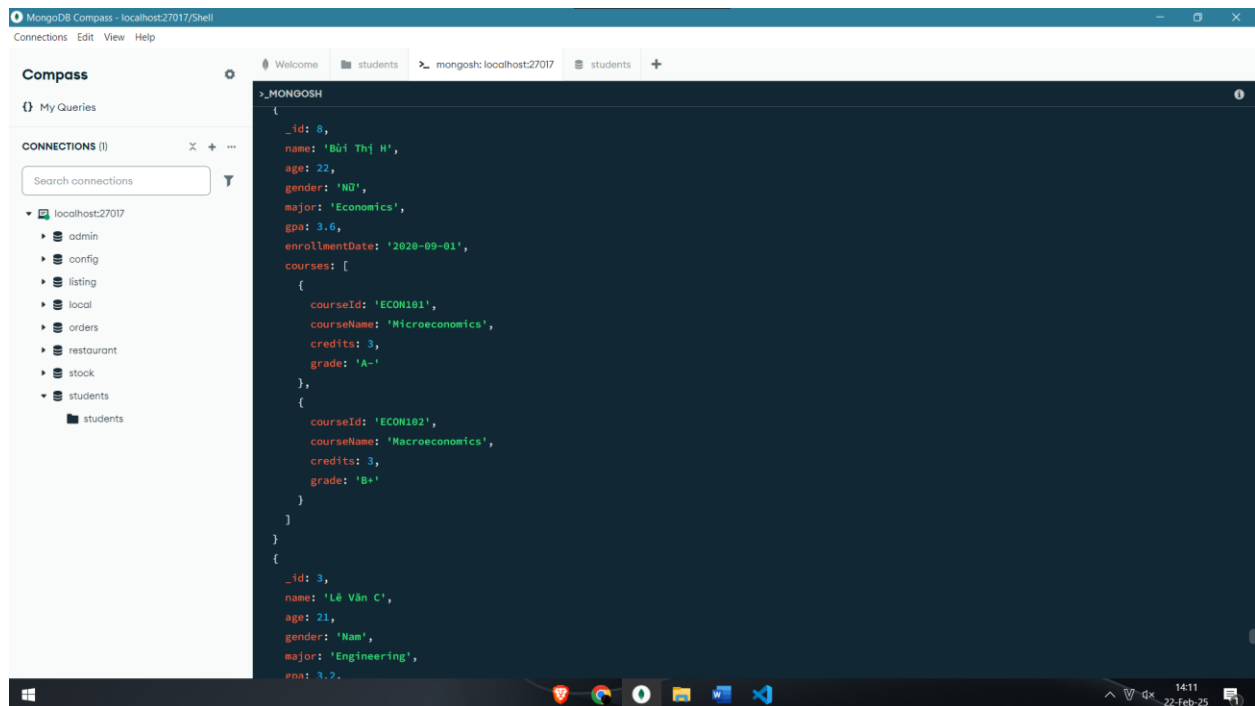
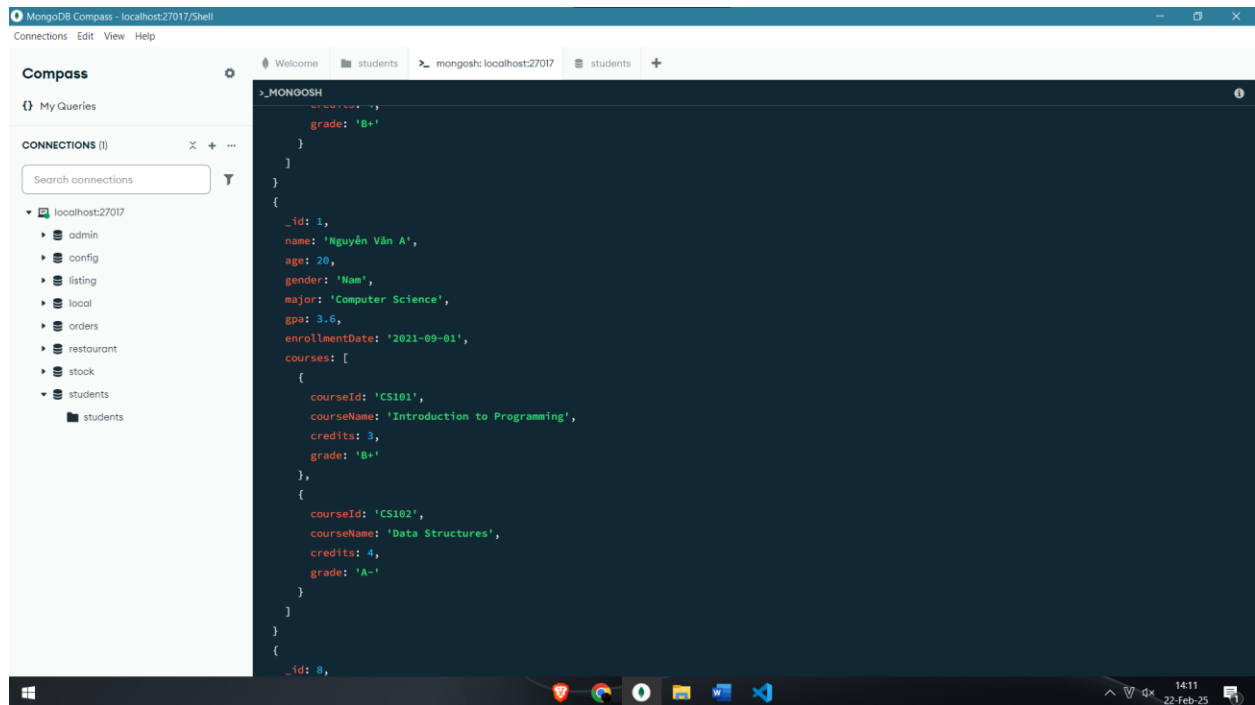
```
>_MONGOOSH
> db.students.find().sort({ major: 1, gpa: -1 })
< [
  {
    _id: 4,
    name: 'Phạm Thị D',
    age: 19,
    gender: 'Nữ',
    major: 'Arts',
    gpa: 3.9,
    enrollmentDate: '2021-09-01',
    courses: [
      {
        courseId: 'ART101',
        courseName: 'History of Art',
        credits: 2,
        grade: 'A'
      },
      {
        courseId: 'ART102',
        courseName: 'Modern Art',
        credits: 3,
        grade: 'A-'
      }
    ]
  },
  {
    _id: 6,
    name: 'Ngô Thị F',
    age: 20,
    gender: 'Nữ',
    major: 'Biology',
    gpa: 3.4,
    enrollmentDate: '2021-09-01',
    courses: [
      {
        courseId: 'BIO101',
        courseName: 'General Biology',
        credits: 3,
        grade: 'B'
      },
      {
        courseId: 'BIO102',
        courseName: 'Genetics',
        credits: 3,
        grade: 'B+'
      }
    ]
  }
]
```



```
>_MONGOOSH
age: 20,
gender: 'Nữ',
major: 'Biology',
gpa: 3.4,
enrollmentDate: '2021-09-01',
courses: [
  {
    courseId: 'BIO101',
    courseName: 'General Biology',
    credits: 3,
    grade: 'B'
  },
  {
    courseId: 'BIO102',
    courseName: 'Genetics',
    credits: 3,
    grade: 'B+'
  }
]
}
]
{
  _id: 2,
  name: 'Trần Thị B',
  age: 22,
  gender: 'Nữ',
  major: 'Business Administration',
  gpa: 3.8,
  enrollmentDate: '2020-09-01',
  courses: [
    {
      courseId: 'BUS101',
      courseName: 'Business Administration',
      credits: 3,
      grade: 'A'
    },
    {
      courseId: 'BUS102',
      courseName: 'Business Law',
      credits: 3,
      grade: 'A-'
    }
  ]
}
```

```
>_MONGOOSH
{
  "courses": [
    {
      "courseId": "BA101",
      "courseName": "Principles of Management",
      "credits": 3,
      "grade": "A"
    },
    {
      "courseId": "BA102",
      "courseName": "Marketing Basics",
      "credits": 3,
      "grade": "B"
    }
  ]
},
{
  "_id": 7,
  "name": "Vũ Văn G",
  "age": 24,
  "gender": "Nam",
  "major": "Chemistry",
  "gpa": 3,
  "enrollmentDate": "2018-09-01",
  "courses": [
    {
      "courseId": "CHEM101",
      "courseName": "Organic Chemistry",
      "credits": 4,
      "grade": "C"
    }
  ]
}
```

```
>_MONGOOSH
{
  "courses": [
    {
      "courseId": "CS101",
      "courseName": "Introduction to Programming",
      "credits": 3,
      "grade": "A"
    },
    {
      "courseId": "CS103",
      "courseName": "Algorithms",
      "credits": 4,
      "grade": "A-"
    },
    {
      "courseId": "CS104",
      "courseName": "Operating Systems",
      "credits": 4,
      "grade": "B+"
    }
  ]
},
{
  "_id": 10,
  "name": "Trần Văn J",
  "age": 22,
  "gender": "Nam",
  "major": "Computer Science",
  "gpa": 4,
  "enrollmentDate": "2019-09-01",
  "courses": [
    {
      "courseId": "CS101",
      "courseName": "Introduction to Programming",
      "credits": 3,
      "grade": "A"
    },
    {
      "courseId": "CS103",
      "courseName": "Algorithms",
      "credits": 4,
      "grade": "A-"
    },
    {
      "courseId": "CS104",
      "courseName": "Operating Systems",
      "credits": 4,
      "grade": "B+"
    }
  ]
}
```



18. Tìm các sinh viên nữ có GPA trên 3.8

db.students.find({ gender: "Nữ", gpa: { \$gt: 3.8 } })

```
> db.students.find({ gender: "NỮ", gpa: { $gt: 3.8 } })
< {
  _id: 4,
  name: 'Phạm Thị D',
  age: 19,
  gender: 'NỮ',
  major: 'Arts',
  gpa: 3.9,
  enrollmentDate: '2021-09-01',
  courses: [
    {
      courseId: 'ART101',
      courseName: 'History of Art',
      credits: 2,
      grade: 'A'
    },
    {
      courseId: 'ART102',
      courseName: 'Modern Art',
      credits: 3,
      grade: 'A-'
    }
  ]
}
```

19. Tính tổng số tín chỉ mà mỗi sinh viên đăng ký

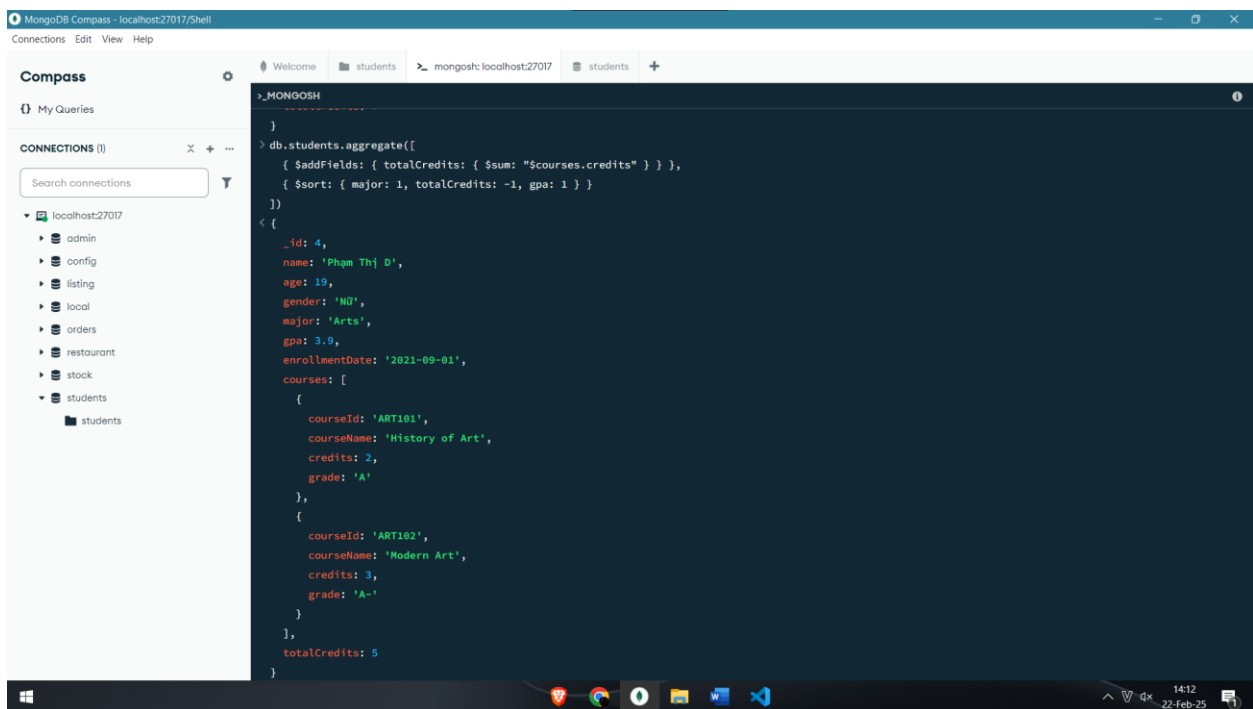
```
db.students.aggregate([
  { $unwind: "$courses" },
  { $group: { _id: "$_id", totalCredits: { $sum: "$courses.credits" } } }
])
```

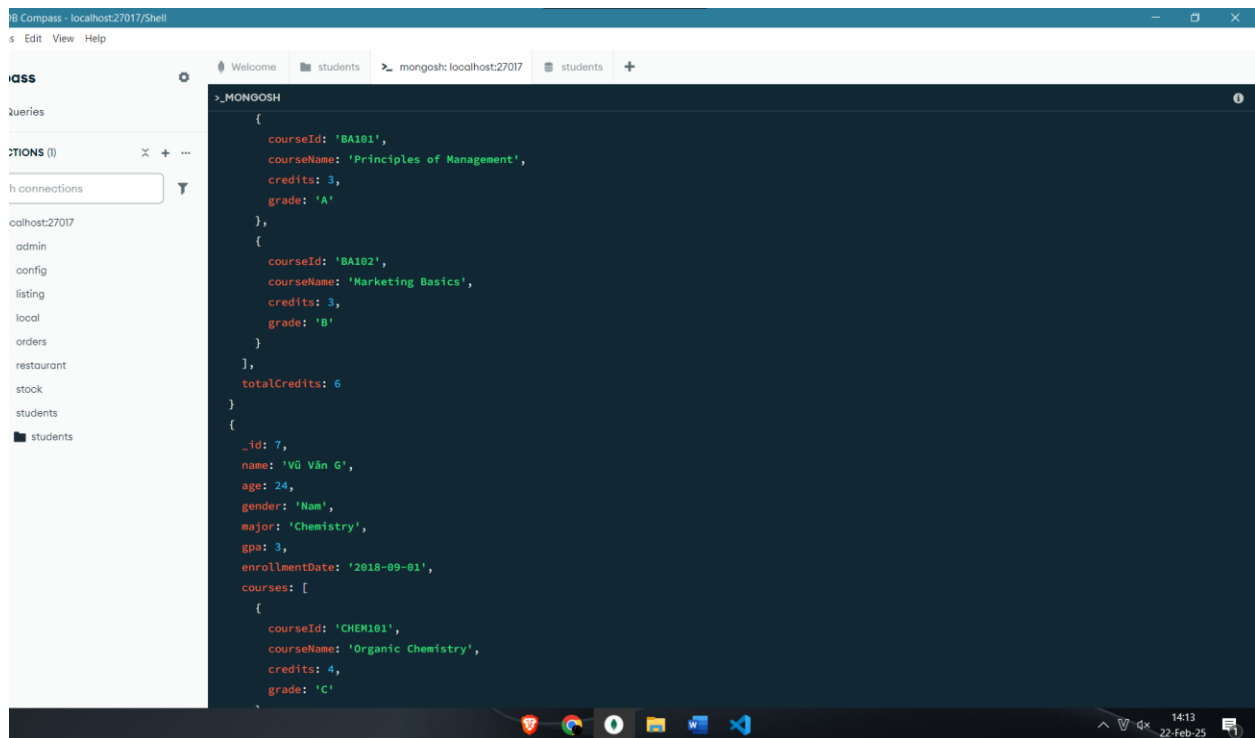
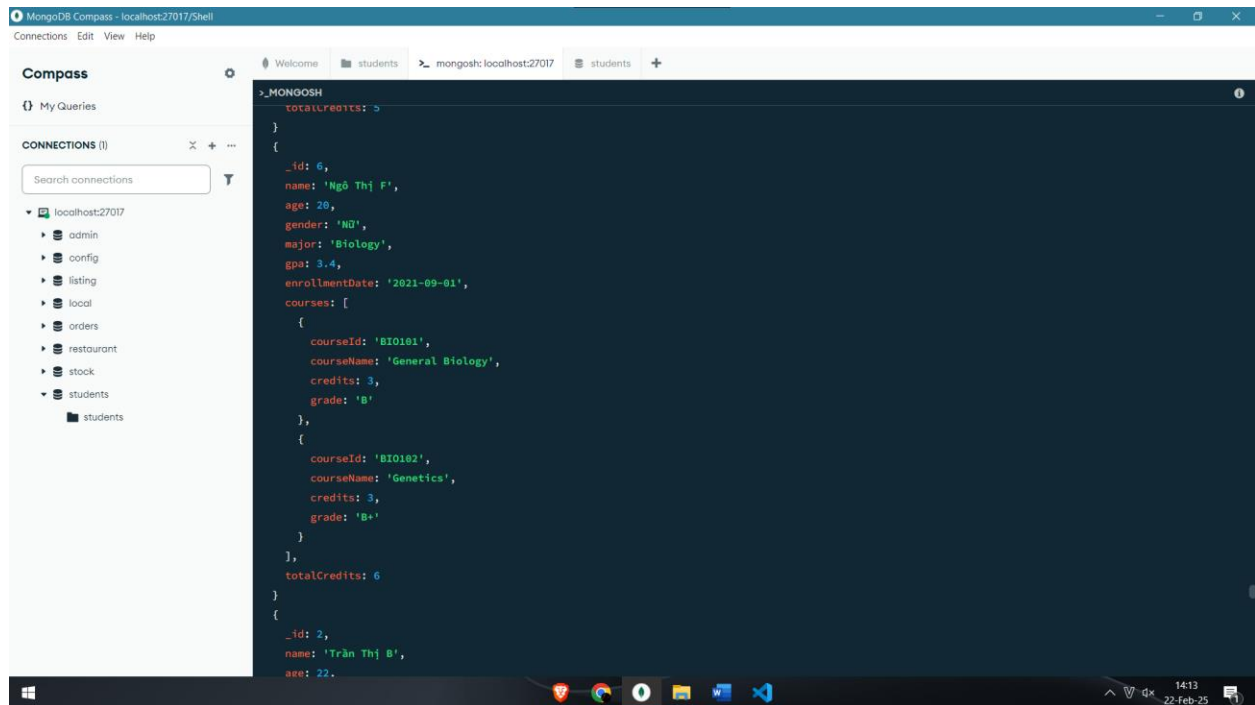
```
> db.students.aggregate([
  { $unwind: "$courses" },
  { $group: { _id: "$_id", totalCredits: { $sum: "$courses.credits" } } }
])
< {
  _id: 6,
  totalCredits: 6
}
{
  _id: 5,
  totalCredits: 10
}
{
  _id: 8,
  totalCredits: 6
}
{
  _id: 10,
  totalCredits: 11
}
{
  _id: 7,
  totalCredits: 7
}
{
  _id: 3,
  totalCredits: 7
}
```

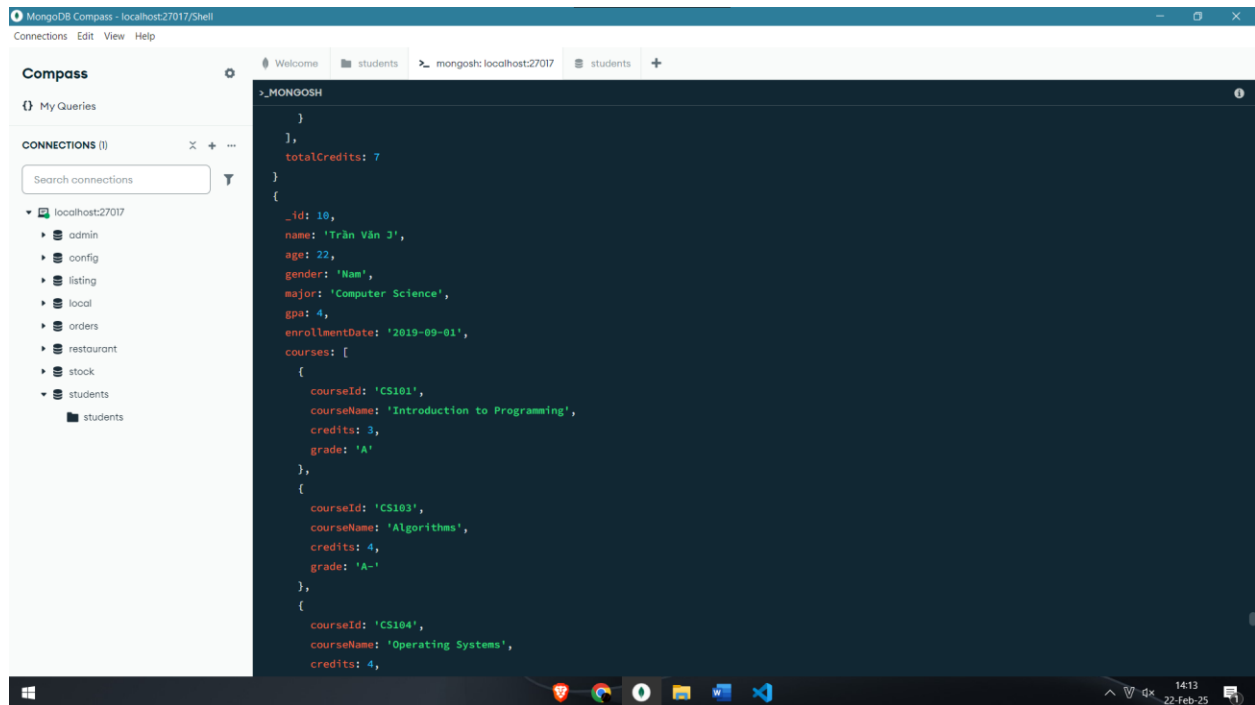
```
{
  _id: 7,
  totalCredits: 7
}
{
  _id: 3,
  totalCredits: 7
}
{
  _id: 1,
  totalCredits: 7
}
{
  _id: 2,
  totalCredits: 6
}
{
  _id: 4,
  totalCredits: 5
}
{
  _id: 9,
  totalCredits: 7
}
```

20. Sắp xếp sinh viên theo ngành học, tổng số tín chỉ giảm dần, GPA tăng dần

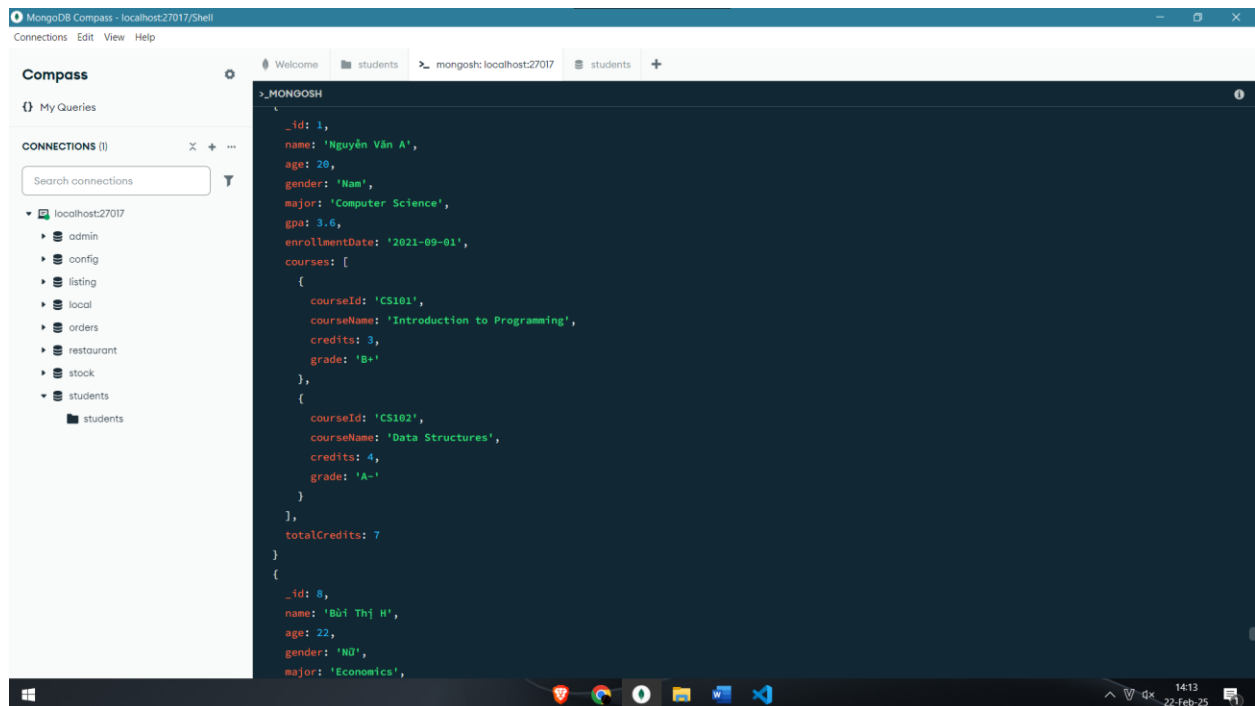
```
db.students.aggregate([
  { $addFields: { totalCredits: { $sum: "$courses.credits" } } },
  { $sort: { major: 1, totalCredits: -1, gpa: 1 } }
])
```







The screenshot shows the MongoDB Compass interface. On the left, the 'CONNECTIONS' panel lists the 'localhost:27017' connection with a tree view of databases including 'students'. The main panel displays a JSON document for a student with the following fields: `_id: 10`, `name: 'Trần Văn J'`, `age: 22`, `gender: 'Nam'`, `major: 'Computer Science'`, `gpa: 4`, `enrollmentDate: '2019-09-01'`, and `courses` (an array of three course objects). The first course is `{ courseId: 'CS101', courseName: 'Introduction to Programming', credits: 3, grade: 'A' }`. The second is `{ courseId: 'CS103', courseName: 'Algorithms', credits: 4, grade: 'A-' }`. The third is `{ courseId: 'CS104', courseName: 'Operating Systems', credits: 4, grade: '' }`. The `totalCredits` field is 7.



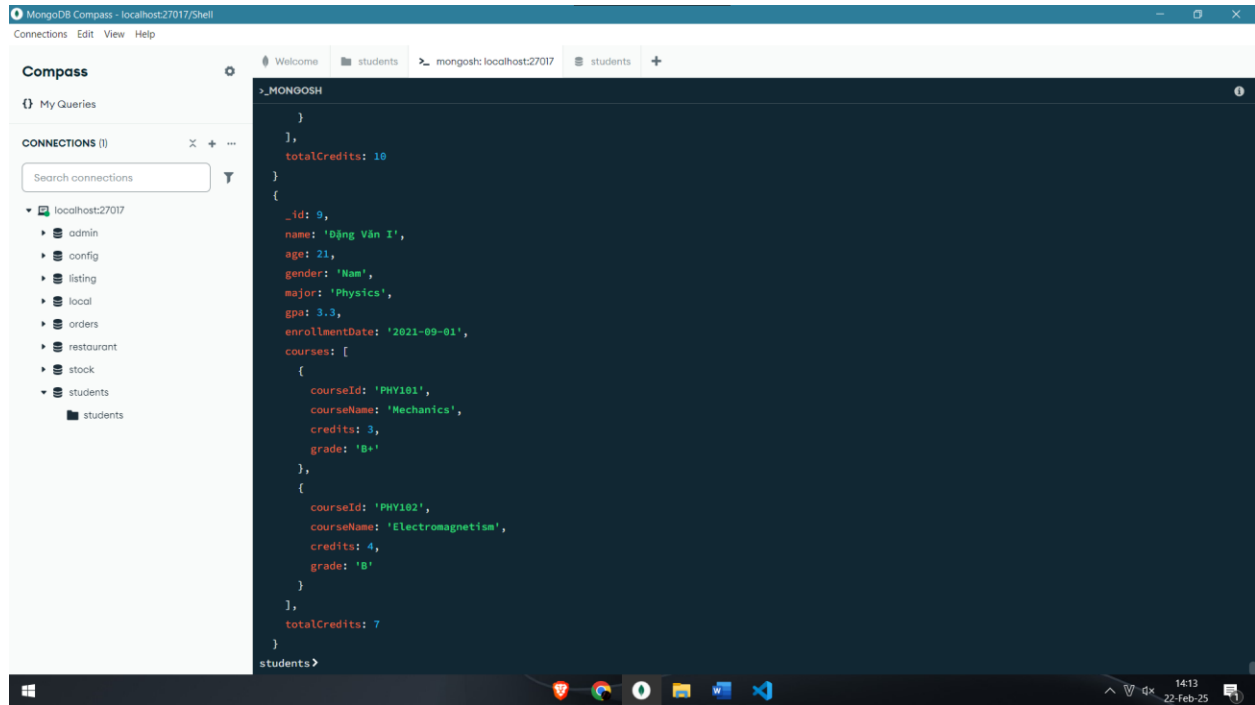
The screenshot shows the MongoDB Compass interface with a different query result. The 'CONNECTIONS' panel is the same. The main panel displays a JSON document for two students. The first student has fields: `_id: 1`, `name: 'Nguyễn Văn A'`, `age: 20`, `gender: 'Nam'`, `major: 'Computer Science'`, `gpa: 3.6`, `enrollmentDate: '2021-09-01'`, and `courses` (an array of two course objects). The first course is `{ courseId: 'CS101', courseName: 'Introduction to Programming', credits: 3, grade: 'B+' }`. The second is `{ courseId: 'CS102', courseName: 'Data Structures', credits: 4, grade: 'A-' }`. The `totalCredits` field is 7. The second student has fields: `_id: 8`, `name: 'Bùi Thị H'`, `age: 22`, `gender: 'Nữ'`, and `major: 'Economics'`. The `totalCredits` field is 7.

The screenshot shows the MongoDB Compass interface. The left sidebar displays the 'connections' list with 'localhost:27017' selected. The main panel shows a query result for the 'students' collection. The result is a JSON document for a student named 'Lê Văn C' with the following details:

```
{
  "_id": 3,
  "name": "Lê Văn C",
  "age": 21,
  "gender": "Nam",
  "major": "Engineering",
  "gpa": 3.2,
  "enrollmentDate": "2022-01-15",
  "courses": [
    {
      "courseId": "ECON102",
      "courseName": "Macroeconomics",
      "credits": 3,
      "grade": "B+"
    },
    {
      "courseId": "ECON101",
      "courseName": "Microeconomics",
      "credits": 3,
      "grade": "A-"
    }
  ],
  "totalCredits": 6
}
```

The screenshot shows the MongoDB Compass interface. The left sidebar displays the 'connections' list with 'localhost:27017' selected. The main panel shows a query result for the 'students' collection. The result is a JSON document for a student named 'Đặng Văn I' with the following details:

```
{
  "_id": 9,
  "name": "Đặng Văn I",
  "age": 21,
  "major": "Mathematics",
  "gpa": 3.7,
  "enrollmentDate": "2019-09-01",
  "courses": [
    {
      "courseId": "MATH101",
      "courseName": "Calculus I",
      "credits": 4,
      "grade": "A"
    },
    {
      "courseId": "MATH102",
      "courseName": "Linear Algebra",
      "credits": 3,
      "grade": "A-"
    },
    {
      "courseId": "MATH103",
      "courseName": "Probability",
      "credits": 3,
      "grade": "B+"
    }
  ],
  "totalCredits": 10
}
```



The screenshot shows the MongoDB Compass interface. The left sidebar displays the 'students' collection under the 'localhost:27017' connection. The main editor shows a document in the 'students' collection with the following fields:

```
>_MONGOOSH
{
  },
  totalCredits: 10
}
{
  _id: 9,
  name: 'Đặng Văn I',
  age: 21,
  gender: 'Nam',
  major: 'Physics',
  gpa: 3.3,
  enrollmentDate: '2021-09-01',
  courses: [
    {
      courseId: 'PHY101',
      courseName: 'Mechanics',
      credits: 3,
      grade: 'B+'
    },
    {
      courseId: 'PHY102',
      courseName: 'Electromagnetism',
      credits: 4,
      grade: 'B'
    }
  ],
  totalCredits: 7
}
students>
```

The Windows taskbar at the bottom shows the time as 14:13 on 22-Feb-25.