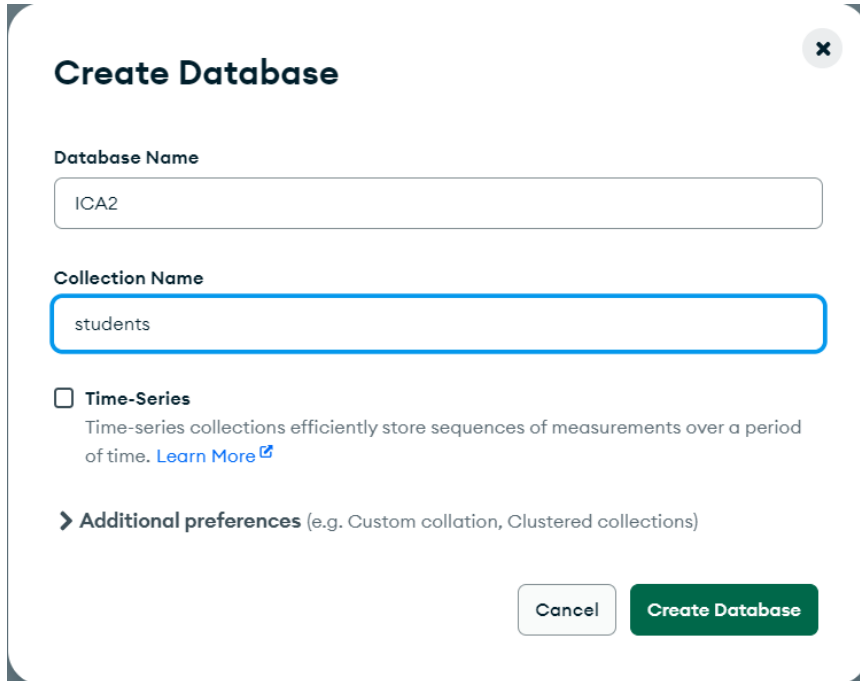# Web Service and Server Technologies – Practical(IT2234)

ICAE 02

1.Create the students and grades collections and insert the sample documents into both collections.

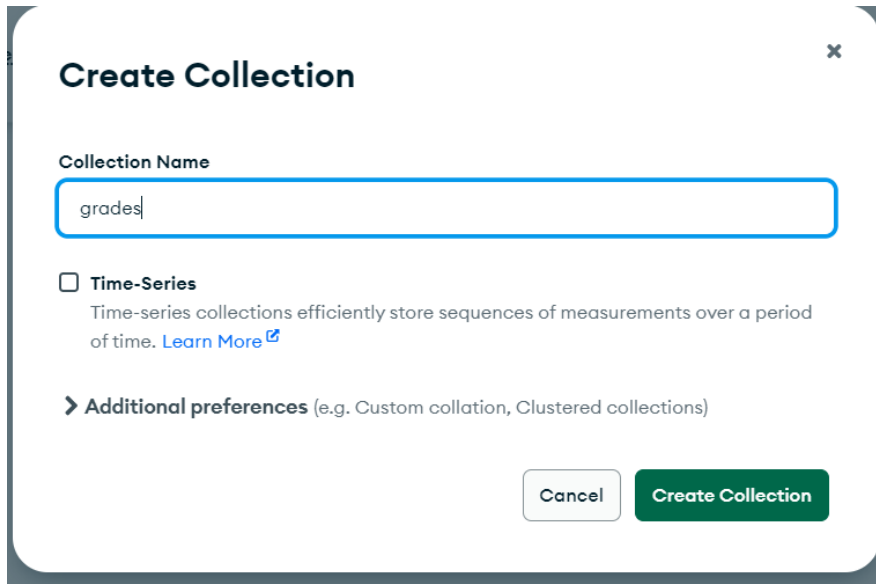**Create Database**

Database Name

ICA2

Collection Name

students

☐ **Time-Series**
Time-series collections efficiently store sequences of measurements over a period of time. Learn More

❯ **Additional preferences** (e.g. Custom collation, Clustered collections)

Cancel   Create Database

Create Collection

Collection Name

grades

☐ **Time-Series**
Time-series collections efficiently store sequences of measurements over a period of time. Learn More

❯ **Additional preferences** (e.g. Custom collation, Clustered collections)

Cancel   Create Collection

```
//Insert sample documents into students collection

db.students.insertMany([

 {

  _id: ObjectId("64b1fcd1f4a13a001e3d41a1"),

  name: "Alice Johnson",

  enrollmentYear: 2021,

  major: "Computer Science",

  email: "alice.johnson@example.com",

  gender: "Female",

  age: 20

 },

 {

  _id: ObjectId("64b1fcd1f4a13a001e3d41a2"),

  name: "Bob Smith",

  enrollmentYear: 2020,

  major: "Mathematics",

  email: "bob.smith@example.com",

  gender: "Male",

  age: 22

 },

 {

  _id: ObjectId("64b1fcd1f4a13a001e3d41a3"),

  name: "Clara Lee",

  enrollmentYear: 2022,

  major: "Physics",

  email: "clara.lee@example.com",
```

```
    gender: "Female",

    age: 19

  },

  {

    _id: ObjectId("64b1fcd1f4a13a001e3d41a4"),

    name: "Daniel Kim",

    enrollmentYear: 2021,

    major: "Engineering",

    email: "daniel.kim@example.com",

    gender: "Male",

    age: 21

  },

  {

    _id: ObjectId("64b1fcd1f4a13a001e3d41a5"),

    name: "Eva Chen",

    enrollmentYear: 2020,

    major: "Biology",

    email: "eva.chen@example.com",

    gender: "Female",

    age: 23

  },

  {

    _id: ObjectId("64b1fcd1f4a13a001e3d41a6"),

    name: "Frank Wright",

    enrollmentYear: 2019,

    major: "Chemistry",
```

```
    email: "frank.wright@example.com",

    gender: "Male",

    age: 24

  },

  {

    _id: ObjectId("64b1fcd1f4a13a001e3d41a7"),

    name: "Grace Liu",

    enrollmentYear: 2022,

    major: "Economics",

    email: "grace.liu@example.com",

    gender: "Female",

    age: 20

  },

  {

    _id: ObjectId("64b1fcd1f4a13a001e3d41a8"),

    name: "Henry Davis",

    enrollmentYear: 2021,

    major: "Philosophy",

    email: "henry.davis@example.com",

    gender: "Male",

    age: 22

  },

  {

    _id: ObjectId("64b1fcd1f4a13a001e3d41a9"),

    name: "Ivy Zhang",

    enrollmentYear: 2020,
```

```
    major: "Statistics",

    email: "ivy.zhang@example.com",

    gender: "Female",

    age: 21

  },

  {

    _id: ObjectId("64b1fcd1f4a13a001e3d41aa"),

    name: "Jack Lee",

    enrollmentYear: 2023,

    major: "Business",

    email: "jack.lee@example.com",

    gender: "Male",

    age: 18

  }

]);
```

```
< {
    acknowledged: true,
    insertedIds: {
      '0': ObjectId('64b1fcd1f4a13a001e3d41a1'),
      '1': ObjectId('64b1fcd1f4a13a001e3d41a2'),
      '2': ObjectId('64b1fcd1f4a13a001e3d41a3'),
      '3': ObjectId('64b1fcd1f4a13a001e3d41a4'),
      '4': ObjectId('64b1fcd1f4a13a001e3d41a5'),
      '5': ObjectId('64b1fcd1f4a13a001e3d41a6'),
      '6': ObjectId('64b1fcd1f4a13a001e3d41a7'),
      '7': ObjectId('64b1fcd1f4a13a001e3d41a8'),
      '8': ObjectId('64b1fcd1f4a13a001e3d41a9'),
      '9': ObjectId('64b1fcd1f4a13a001e3d41aa')
    }
  }
ICA2 >
```

Type a query: { field: 'value' } or **Generate query** + Explain Reset Find </> Options ▸

● ADD DATA ▾   ⬈ EXPORT DATA ▾   ✎ UPDATE   🗑 DELETE   25 ▾ 1 – 10 of 10 ⟳ ‹ › ▾ ☰ {} E

```
_id: ObjectId('64b1fcd1f4a13a001e3d41a1')
name : "Alice Johnson"
enrollmentYear : 2021
major : "Computer Science"
email : "alice.johnson@example.com"
gender : "Female"
age : 20

_id: ObjectId('64b1fcd1f4a13a001e3d41a2')
name : "Bob Smith"
enrollmentYear : 2020
major : "Mathematics"
email : "bob.smith@example.com"
gender : "Male"
age : 22

_id: ObjectId('64b1fcd1f4a13a001e3d41a3')
name : "Clara Lee"
enrollmentYear : 2022
major : "Physics"
email : "clara.lee@example.com"
gender : "Female"
age : 19
```

// Insert sample documents into grades collection

db.grades.insertMany([

  { subject: "Mathematics", score: 85, term: "Fall 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a1") },

  { subject: "English", score: 90, term: "Fall 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a1") },

  { subject: "Mathematics", score: 75, term: "Spring 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a2") },

  { subject: "Statistics", score: 80, term: "Fall 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a2") },

  { subject: "Physics", score: 92, term: "Fall 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a3") },

{ subject: "Mathematics", score: 86, term: "Spring 2023", studentId: ObjectId("64b1fcd1f4a13a001e3d41a3") },

{ subject: "Engineering", score: 89, term: "Fall 2021", studentId: ObjectId("64b1fcd1f4a13a001e3d41a4") },

{ subject: "Mathematics", score: 84, term: "Spring 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a4") },

{ subject: "Biology", score: 78, term: "Spring 2021", studentId: ObjectId("64b1fcd1f4a13a001e3d41a5") },

{ subject: "Chemistry", score: 82, term: "Fall 2021", studentId: ObjectId("64b1fcd1f4a13a001e3d41a5") },

{ subject: "Chemistry", score: 88, term: "Fall 2021", studentId: ObjectId("64b1fcd1f4a13a001e3d41a6") },

{ subject: "Physics", score: 79, term: "Spring 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a6") },

{ subject: "Economics", score: 83, term: "Spring 2023", studentId: ObjectId("64b1fcd1f4a13a001e3d41a7") },

{ subject: "English", score: 89, term: "Fall 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a7") },

{ subject: "Philosophy", score: 91, term: "Fall 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a8") },

{ subject: "History", score: 77, term: "Spring 2023", studentId: ObjectId("64b1fcd1f4a13a001e3d41a8") },

{ subject: "Statistics", score: 79, term: "Spring 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a9") },

{ subject: "Data Science", score: 88, term: "Fall 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a9") },

{ subject: "Business", score: 87, term: "Fall 2023", studentId: ObjectId("64b1fcd1f4a13a001e3d41aa") },

{ subject: "Finance", score: 82, term: "Spring 2024", studentId: ObjectId("64b1fcd1f4a13a001e3d41aa") }

]);

```
>_MONGOSH
  { subject: "Finance", score: 82, term: "Spring 2024", studentId: ObjectId("64b1fcd1f4a13a001e3d41aa") }
]);
< {
  acknowledged: true,
  insertedIds: {
    '0': ObjectId('682760962d45e5a3987a2d99'),
    '1': ObjectId('682760962d45e5a3987a2d9a'),
    '2': ObjectId('682760962d45e5a3987a2d9b'),
    '3': ObjectId('682760962d45e5a3987a2d9c'),
    '4': ObjectId('682760962d45e5a3987a2d9d'),
    '5': ObjectId('682760962d45e5a3987a2d9e'),
    '6': ObjectId('682760962d45e5a3987a2d9f'),
    '7': ObjectId('682760962d45e5a3987a2da0'),
    '8': ObjectId('682760962d45e5a3987a2da1'),
    '9': ObjectId('682760962d45e5a3987a2da2'),
    '10': ObjectId('682760962d45e5a3987a2da3'),
    '11': ObjectId('682760962d45e5a3987a2da4'),
    '12': ObjectId('682760962d45e5a3987a2da5'),
    '13': ObjectId('682760962d45e5a3987a2da6'),
    '14': ObjectId('682760962d45e5a3987a2da7'),
    '15': ObjectId('682760962d45e5a3987a2da8'),
    '16': ObjectId('682760962d45e5a3987a2da9'),
    '17': ObjectId('682760962d45e5a3987a2daa'),
    '18': ObjectId('682760962d45e5a3987a2dab'),
    '19': ObjectId('682760962d45e5a3987a2dac')
  }
}
```

Documents 0   Aggregations   Schema   Indexes 1   Validation

Type a query: { field: 'value' } or **Generate query** +

Explain   Reset   Find   </>   Options

⊕ ADD DATA ▾   ⮥ EXPORT DATA ▾   ✎ UPDATE   🗑 DELETE

25 ▾ 1 – 20 of 20 ⟳   ⟨ ⟩

```
_id: ObjectId('682760962d45e5a3987a2d99')
subject : "Mathematics"
score : 85
term : "Fall 2022"
studentId : ObjectId('64b1fcd1f4a13a001e3d41a1')

_id: ObjectId('682760962d45e5a3987a2d9a')
subject : "English"
score : 90
term : "Fall 2022"
studentId : ObjectId('64b1fcd1f4a13a001e3d41a1')

_id: ObjectId('682760962d45e5a3987a2d9b')
subject : "Mathematics"
score : 75
term : "Spring 2022"
studentId : ObjectId('64b1fcd1f4a13a001e3d41a2')

_id: ObjectId('682760962d45e5a3987a2d9c')
subject : "Statistics"
score : 80
term : "Fall 2022"
studentId : ObjectId('64b1fcd1f4a13a001e3d41a2')
```

2. Show both collections in table view

Documents 0 | Aggregations | Schema | Indexes 1 | Validation

Type a query: { field: 'value' } or **Generate query** | Explain | Reset | Find | </> | Options ▶

⊕ ADD DATA ▾ | EXPORT DATA ▾ | UPDATE | DELETE | 25 ▾ | 1 – 10 of 10

🏠 students

	_id ObjectId	name String	enrollmentYear Int32	major String	email String				
1	ObjectId('64b1fcd1f4a13a0…	"Alice Johnson"	2021	"Computer Science"	"alice.johnson@exampl				
2	ObjectId('64b1fcd1f4a13a0…	"Bob Smith"	2020	"Mathematics"	"bob.smith@example.c				
3	ObjectId('64b1fcd1f4a13a0…	"Clara Lee"	2022	"Physics"	"clara.lee@example.c				
4	ObjectId('64b1fcd1f4a13a0…	"Daniel Kim"	2021	"Engineering"	"daniel.kim@example.				
5	ObjectId('64b1fcd1f4a13a0…	"Eva Chen"	2020	"Biology"	"eva.chen@example.co				
6	ObjectId('64b1fcd1f4a13a0…	"Frank Wright"	2019	"Chemistry"	"frank.wright@exampl				
7	ObjectId('64b1fcd1f4a13a0…	"Grace Liu"	2022	"Economics"	"grace.liu@example.c				
8	ObjectId('64b1fcd1f4a13a0…	"Henry Davis"	2021	"Philosophy"	"henry.davis@example				
9	ObjectId('64b1fcd1f4a13a0…	"Ivy Zhang"	2020	"Statistics"	"ivy.zhang@example.c				
10	ObjectId('64b1fcd1f4a13a0…	"Jack Lee"	2023	"Business"	"jack.lee@example.co				

Documents 0 | Aggregations | Schema | Indexes 1 | Validation

Type a query: { field: 'value' } or **Generate query** | Explain | Reset | Find | </> | Options ▶

⊕ ADD DATA ▾ | EXPORT DATA ▾ | UPDATE | DELETE | 25 ▾ | 1 – 20 of 20

🏠 grades

	_id ObjectId	subject String	score Int32	term String	studentId ObjectId				
1	ObjectId('682760962d45e5a…	"Mathematics"	85	"Fall 2022"	ObjectId('64b1fcd1f				
2	ObjectId('682760962d45e5a…	"English"	90	"Fall 2022"	ObjectId('64b1fcd1f				
3	ObjectId('682760962d45e5a…	"Mathematics"	75	"Spring 2022"	ObjectId('64b1fcd1f				
4	ObjectId('682760962d45e5a…	"Statistics"	80	"Fall 2022"	ObjectId('64b1fcd1f				
5	ObjectId('682760962d45e5a…	"Physics"	92	"Fall 2022"	ObjectId('64b1fcd1f				
6	ObjectId('682760962d45e5a…	"Mathematics"	86	"Spring 2023"	ObjectId('64b1fcd1f				
7	ObjectId('682760962d45e5a…	"Engineering"	89	"Fall 2021"	ObjectId('64b1fcd1f				
8	ObjectId('682760962d45e5a…	"Mathematics"	84	"Spring 2022"	ObjectId('64b1fcd1f				
9	ObjectId('682760962d45e5a…	"Biology"	78	"Spring 2021"	ObjectId('64b1fcd1f				
10	ObjectId('682760962d45e5a…	"Chemistry"	82	"Fall 2021"	ObjectId('64b1fcd1f				
11	ObjectId('682760962d45e5a…	"Chemistry"	88	"Fall 2021"	ObjectId('64b1fcd1f				
12	ObjectId('682760962d45e5a…	"Physics"	79	"Spring 2022"	ObjectId('64b1fcd1f				
13	ObjectId('682760962d45e5a…	"Economics"	83	"Spring 2023"	ObjectId('64b1fcd1f				
14	ObjectId('682760962d45e5a…	"English"	89	"Fall 2022"	ObjectId('64b1fcd1f				
15	ObjectId('682760962d45e5a…	"Philosophy"	91	"Fall 2022"	ObjectId('64b1fcd1f				
16	ObjectId('682760962d45e5a…	"History"	77	"Spring 2023"	ObjectId('64b1fcd1f				

3. Find the female students and only display their name, age and gender

db.students.find(

 { gender: "Female" },

 { _id: 0, name: 1, age: 1, gender: 1 }

);

```
>_MONGOSH

> db.students.find(
    { gender: "Female" },
    { _id: 0, name: 1, age: 1, gender: 1 }
  );
< {
    name: 'Alice Johnson',
    gender: 'Female',
    age: 20
  }
  {
    name: 'Clara Lee',
    gender: 'Female',
    age: 19
  }
  {
    name: 'Eva Chen',
    gender: 'Female',
    age: 23
  }
  {
    name: 'Grace Liu',
    gender: 'Female',
    age: 20
  }
  {
    name: 'Ivy Zhang',
    gender: 'Female',
    age: 21
```

4. Find the students who are younger than 22 and enrolled after 2020

db.students.find(

 { age: { $lt: 22 }, enrollmentYear: { $gt: 2020 } }

);

```
>_MONGOSH

> db.students.find(
    { age: { $lt: 22 }, enrollmentYear: { $gt: 2020 } }
  );
< {
    _id: ObjectId('64b1fcd1f4a13a001e3d41a1'),
    name: 'Alice Johnson',
    enrollmentYear: 2021,
    major: 'Computer Science',
    email: 'alice.johnson@example.com',
    gender: 'Female',
    age: 20
  }
  {
    _id: ObjectId('64b1fcd1f4a13a001e3d41a3'),
    name: 'Clara Lee',
    enrollmentYear: 2022,
    major: 'Physics',
    email: 'clara.lee@example.com',
    gender: 'Female',
    age: 19
  }
  {
    _id: ObjectId('64b1fcd1f4a13a001e3d41a4'),
    name: 'Daniel Kim',
    enrollmentYear: 2021,
    major: 'Engineering',
    email: 'daniel.kim@example.com',
    gender: 'Male',
```

```
>_MONGOSH

  {
    _id: ObjectId('64b1fcd1f4a13a001e3d41a4'),
    name: 'Daniel Kim',
    enrollmentYear: 2021,
    major: 'Engineering',
    email: 'daniel.kim@example.com',
    gender: 'Male',
    age: 21
  }
  {
    _id: ObjectId('64b1fcd1f4a13a001e3d41a7'),
    name: 'Grace Liu',
    enrollmentYear: 2022,
    major: 'Economics',
    email: 'grace.liu@example.com',
    gender: 'Female',
    age: 20
  }
  {
    _id: ObjectId('64b1fcd1f4a13a001e3d41aa'),
    name: 'Jack Lee',
    enrollmentYear: 2023,
    major: 'Business',
    email: 'jack.lee@example.com',
    gender: 'Male',
    age: 18
  }
ICA2 >
```

5. Find all grades for "Alice Johnson"

const student = db.students.findOne({ name: "Alice Johnson" });

db.grades.find({ studentId: student._id });

```
> const student = db.students.findOne({ name: "Alice Johnson" });
  db.grades.find({ studentId: student._id });
< {
    _id: ObjectId('682760962d45e5a3987a2d99'),
    subject: 'Mathematics',
    score: 85,
    term: 'Fall 2022',
    studentId: ObjectId('64b1fcd1f4a13a001e3d41a1')
  }
  {
    _id: ObjectId('682760962d45e5a3987a2d9a'),
    subject: 'English',
    score: 90,
    term: 'Fall 2022',
    studentId: ObjectId('64b1fcd1f4a13a001e3d41a1')
  }
ICA2 >
```

6. Find how many students followed the subject "Mathematics"

db.grades.distinct("studentId", { subject: "Mathematics" }).length;

```
  }
> db.grades.distinct("studentId", { subject: "Mathematics" }).length;
< 4
ICA2 >
```

7. Find all students with grades in the term "Fall 2022"

db.students.aggregate([

  {

    $lookup: {

      from: "grades",

      localField: "_id",

```
      foreignField: "studentId",

      as: "grades"

    }

  },

  {

    $project: {

      name: 1,

      email: 1,

      age: 1,

      gender: 1,

      grades: {

        $filter: {

          input: "$grades",

          as: "grade",

          cond: { $eq: ["$$grade.term", "Fall 2022"] }

        }

      }

    }

  },

  {

    $match: {

      "grades.0": { $exists: true }

    }

  }

]);
```

```
>_MONGOSH
> db.students.aggregate([
    {
      $lookup: {
        from: "grades",
        localField: "_id",
        foreignField: "studentId",
        as: "grades"
      }
    },
    {
      $project: {
        name: 1,
        email: 1,
        age: 1,
        gender: 1,
        grades: {
          $filter: {
            input: "$grades",
            as: "grade",
            cond: { $eq: ["$$grade.term", "Fall 2022"] }
          }
        }
      }
    },
    {
      $match: {
        "grades.0": { $exists: true }
      }
```

```
>_MONGOSH
< {
    _id: ObjectId('64b1fcd1f4a13a001e3d41a1'),
    name: 'Alice Johnson',
    email: 'alice.johnson@example.com',
    gender: 'Female',
    age: 20,
    grades: [
      {
        _id: ObjectId('682760962d45e5a3987a2d99'),
        subject: 'Mathematics',
        score: 85,
        term: 'Fall 2022',
        studentId: ObjectId('64b1fcd1f4a13a001e3d41a1')
      },
      {
        _id: ObjectId('682760962d45e5a3987a2d9a'),
        subject: 'English',
        score: 90,
        term: 'Fall 2022',
        studentId: ObjectId('64b1fcd1f4a13a001e3d41a1')
      }
    ]
  }
  {
    _id: ObjectId('64b1fcd1f4a13a001e3d41a2'),
    name: 'Bob Smith',
    email: 'bob.smith@example.com',
    gender: 'Male',
```

```
>_MONGOSH
  {
    _id: ObjectId('64b1fcd1f4a13a001e3d41a2'),
    name: 'Bob Smith',
    email: 'bob.smith@example.com',
    gender: 'Male',
    age: 22,
    grades: [
      {
        _id: ObjectId('682760962d45e5a3987a2d9c'),
        subject: 'Statistics',
        score: 80,
        term: 'Fall 2022',
        studentId: ObjectId('64b1fcd1f4a13a001e3d41a2')
      }
    ]
  }
  {
    _id: ObjectId('64b1fcd1f4a13a001e3d41a3'),
    name: 'Clara Lee',
    email: 'clara.lee@example.com',
    gender: 'Female',
    age: 19,
    grades: [
      {
        _id: ObjectId('682760962d45e5a3987a2d9d'),
        subject: 'Physics',
        score: 92,
        term: 'Fall 2022',
```

```
>_MONGOSH
    _id: ObjectId('64b1fcd1f4a13a001e3d41a7'),
    name: 'Grace Liu',
    email: 'grace.liu@example.com',
    gender: 'Female',
    age: 20,
    grades: [
      {
        _id: ObjectId('682760962d45e5a3987a2da6'),
        subject: 'English',
        score: 89,
        term: 'Fall 2022',
        studentId: ObjectId('64b1fcd1f4a13a001e3d41a7')
      }
    ]
  }
  {
    _id: ObjectId('64b1fcd1f4a13a001e3d41a8'),
    name: 'Henry Davis',
    email: 'henry.davis@example.com',
    gender: 'Male',
    age: 22,
    grades: [
      {
        _id: ObjectId('682760962d45e5a3987a2da7'),
        subject: 'Philosophy',
        score: 91,
        term: 'Fall 2022',
        studentId: ObjectId('64b1fcd1f4a13a001e3d41a8')
```

```
    age: 22,
    grades: [
      {
        _id: ObjectId('682760962d45e5a3987a2da7'),
        subject: 'Philosophy',
        score: 91,
        term: 'Fall 2022',
        studentId: ObjectId('64b1fcd1f4a13a001e3d41a8')
      }
    ]
  }
  {
    _id: ObjectId('64b1fcd1f4a13a001e3d41a9'),
    name: 'Ivy Zhang',
    email: 'ivy.zhang@example.com',
    gender: 'Female',
    age: 21,
    grades: [
      {
        _id: ObjectId('682760962d45e5a3987a2daa'),
        subject: 'Data Science',
        score: 88,
        term: 'Fall 2022',
        studentId: ObjectId('64b1fcd1f4a13a001e3d41a9')
      }
    ]
  }
ICA2 >
```