

Proposal for a Course Support System for Database Exercises

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1

Background

- Databases are used in various information systems
- It is very important for a student to learn how databases function
- It is necessary to make the database system available to each student's computer and distribute databases for learning
- Time is required for setup of the environment
- Setup of the environment is difficult for some students

2

Related work

- There are studies on systems supporting database exercises [1-6]
- However some systems can only perform SQL, not have grading function
- Not assumed that an O/R mapper will be used
- O/R mappers are prevalent in the current operation of actual database

We believed learning O/R mappers are necessary

3

3

Objective

- Propose a new course support system for database exercises
 - As a web application
- Our system makes it easier to learn to use database
- In our system, O/R Mapper is supported
- Our system allows instructors to check student progress on the exercises

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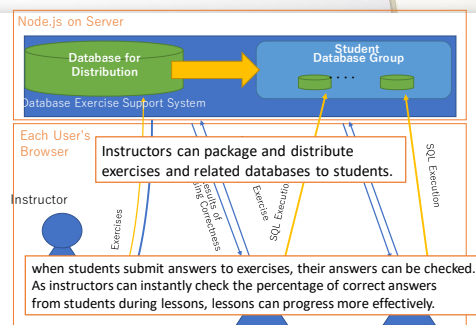
Flow of Lessons

- Instructors distribute tasks and databases to perform them to every student on the system
 - The database for distribution is replicated and created for each student account
- Students log in to the system, select a task and code and run a SQL statement or a program including O/R mapper and submit the answer
- Instructors confirm the overall submission status and content of the submissions

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Outline of our system



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Account of our system

- There are two kinds of accounts:
 - Student and instructor
- Student
 - It is possible to execute SQL, roll back the database, submit exercise's answer
- Instructor
 - All the functions available through a student account
 - Distribute the exercises and exercise database
 - Check the answers of exercise
 - Create student accounts
 - Manages the system

7

Screen: a task on SQL

Content of a task

Input fields of SQL

Results of SQL

8

Screen: a task to operate the database using O/R mapper

Content of a task

Editor. Student write a code using O/R mapper

Standard output

Standard error output

9

Verified by a questionnaire

- We used our system in a class and conducted a survey about the experience
 - There are 76 students and the average class attendance per lesson was 64.5 students
- On the last day of the course, a survey was conducted
 - 61 students responded
 - The five items for which results are collected

10

Q1) Where did you first experience a hurdle in your learning?

System login and usage	8
Tasks about SQL statements	23
Tasks about an O/R mapper	39
Other	2
Nothing in particular	8

- It is clear that the fewer students found that our system itself was a hurdle to learning than the tasks themselves.
- We believe that the goal of the system to mitigate problems arise at the outset of learning is largely achieved

11

Q2) Where did you encounter problems with tasks using SQL?

SQL statements descriptions	21
SQL execution	14
Grading and submitting	36
Other	3
Nothing in particular	4

- When executing SQL statements, the students felt that there was a problem with the grading and submitting
- This problem occurs as a result of a failure in judgment because the automatic grading function of our system is based on exact matches

12

Q3) Where did you encounter problems with tasks using an O/R mapper?

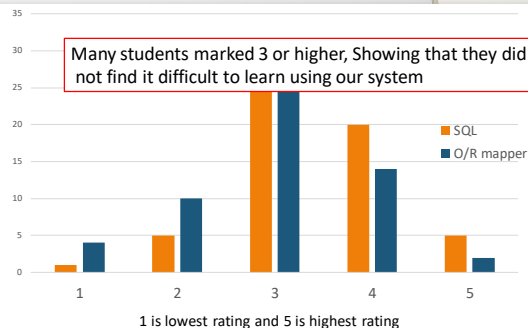
Understanding an O/R mapper concepts	27
JavaScript grammar	25
Sequelize usage	15
Checking for error locations	30
Executing and submitting programs	16
Other	1
Nothing in particular	6

- When executing O/R mapper, the students felt that there was a problem understanding the concepts of the O/R mapper and using JavaScript

13

13

Q4,Q5) Did this system make learning SQL/ORM easier ?



14

14

Conclusion

- Proposed a database exercise support system that aids in lessons involving database exercises
- Used our system in an actual course
- Conducted a survey of the students using questionnaire
- Discovered that our goal of mitigating the problems related to installing the environment was largely **achieved**
- Our system allows students and a teacher to focus on the essential contents of the database course by using our system

15

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Future Work

- The survey results revealed a need to improve the automatic grading function
- We plan to improve the overall operability of our system

16

16

- Thank you!

17

17