Database Security in System Design
High School Achievement Expertise

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Abstract

Surakarta City's State SMA has a variety of accomplishments. To observe these
accomplishments, you will need an expert system to educate the community about
the school's accomplishments, including student and teacher or educator accomplishments. It is
also vital to construct the system database while creating the school achievement expert
system. When creating a system, developers frequently overlook the data security element of
the database. Data mapping, context diagrams, and table relations are all used in the system
architecture. This research will also look at MySQL's database access rights limitations, which
help control who may access the database. The authors describe a web-based school
achievement expert system design based on this architecture as a source of information on
accomplishment in public high schools in Surakarta. Literature research, data gathering,
developing a performance expert system, and designing and security system database
security procedures at Public Senior High School Surakarta are used in this study. The school
accomplishment expert system at Public Senior High School Surakarta based on achievement
category, achievement level, year of achievement, and the design of the school achievement
expert system database in terms of database security are the study's findings.

Keywords : Expertise, Achievement, Database, MySQL.

1. Introduction

The use of information technology adds significantly to the seamless operation of
educational activities. When data storage is backed by one of the most significant information
technology components, namely the database, proper information technology may aid in
making choices.

The school achievement expert system stores, retrieves, and analyzes data on a
school's accomplishments[1]. The shown school successes are divided into three categories:
school achievements, educator achievements, and student achievements.
The determination of a school's expertise must be objective and based on defined criteria. These constraints might take the form of school accreditation, instructor accomplishments, or the school's accomplishments[2]. By looking at some of the factors employed, schools may be determined based on their competence in school accomplishment. The school accomplishment expert system should assist in comparing all current schools' performance expertise.

Several research on the design of expert systems has focused solely on the software side of the system, leaving the database's security unaddressed.

The database and the information system are inextricably linked. Similarly, the existence of a database is inextricably linked to an expert system. The role access system will be highlighted in the database design on the expert system, which will employ a MySQL database customized to the role access of each user account generated in the database[3]. When examining the search results of the school accomplishment expert system, this seeks to reduce data processing mistakes through the MySQL database. Several types of research are linked to the design of the database on the expert system and the database security system.

This research will look at creating a high school achievement expert system in Surakarta City and the database for the system, taking into consideration school achievement criteria from both the teaching staff and the students[4].

2. Research Methodology
   This research explains how to create a performance expert system at Public Senior High School in Surakarta City and design a MySQL database system with determined access permissions roles for each user account. This study's flow is as follows:
   1. Study of literature
      I am studying hypotheses based on research papers as a literature review. Expert systems, database design, and database security protocols are connected to this study.
   2. Data collection
      Data is collected by observing the Ministry of Education and Culture's website, http://school.data.kemendikbud.go.id/. Secondary data, such as student achievement statistics and educators, was acquired.
   3. Expert system design
      A school achievement expert system design was created at Public Senior High School in Surakarta City based on the data received. An expert system sitemap, a search framework and performance statistics, and a search results interface are part of the design[5].
   4. Expert system database security design and procedures
      Make a database design based on the expert system design. Create the necessary tables and relationships to create a database design[6]. Determine the technique for database security based on the access privileges role of each user account after the database design is completed.
   5. Research results
      The findings of this study are the school achievement expert system and the design and technique of database security in the school achievement expert system at Public Senior High School in Surakarta City.
3. Results and Discussion

The creation of a public high school accomplishment expert system in Surakarta is discussed in this study, which includes developing an expert system, process modeling, database design, and a school achievement expert system [7]. The authors of this study used data from the Ministry of Education and Culture's website, http://sekolah.data.kemdikbud.go.id/, to process it into an expert system. Based on these findings, the authors created a school accomplishment expert system site map, which contains an expert system site map seen in Figure 1.

Figure 1. Expert System Sitemap Diagram

Figure 2 shows the primary menu framework on the school achievement expert system, including search, statistics, and download of the statistical framework file.
According to the expert mapping site map and framework system built above, the system includes tools for accessing school data, school comparisons, looking for school achievement and school statistics[8], and downloading evidence of school achievement. Process modeling can be built based on the expert system mapping completed, as shown in Figure 3.

**Figure 2. Performance Statistics Framework Diagram**

A database design can be created by linking the tables in the expert system design. The achievement table, achievement category, school table, file download, student, city,
educator[6], and admin tables are all required in the database design. Figure 4 depicts the required relationships between tables in the expert database.

**Figure 4. Expertise Database Relations**

It is required to create a foreign key constraint based on the table relation in Figure 4 so that the associated data entry does not occur due to a database, program, or expert system error. A foreign key in the achievement table tied to the school table is one example given by the author [9].

If the author tests the data input using SQL by filling in the school id data in the accomplishment table not contained in the school record (as shown in Figure 5), the data will not be stored, and an error notice will be displayed.

```
ALTER TABLE `prestasi` ADD CONSTRAINT `fk_school`
FOREIGN KEY (`id_school`) REFERENCEs `school` (kd_school)
ON DELETE RESTRICT ON UPDATE RESTRICT;
```

**Figure 5. Performance Table Constraints**

In designing the expert system database data, it is also necessary to pay attention to the input format that must be met so that the input is valid both from the program side and the database[8]. Figure 7 shows the creation of a trigger to validate email input on the educator table from the database side used.
CREATE TRIGGER `cek_email`
BEFORE INSERT ON `teachers` 
FOR EACH ROW 
IF NEW. `email` NOT LIKE '%_@%_.%'
THEN SIGNAL SQLSTATE VALUE '4500'
SET MESSAGE_TEXT = '[table:teacher] - `email` column is not valid';
END IF;

Figure 6. Trigger Valid Format Email

In addition to critical foreign limitations, the expert database design must consider the user's access permissions or role access while accessing the expert database to ensure data security in the event of data misuse [10].

The author creates two users to access the expert database when developing the expert system, including user access rights and admin access rights, with each role having different access privileges[11].

Based on the access rights granted by user: user_expert, when the user accesses the database with the user user_expert admin_achievement table, it will not be able to appear and cannot be accessed user_expert is not given any rights to access the admin_achievement table [12]. Meanwhile, if the admin logs in with the expert admin_user, the admin_achievement table can be accessed by the admin_expert user.

If the user uses the user user_pakarmaka, then the user will only view data and cannot add, update and delete data. If the user uses the user user_expert user to add, update or delete data via MySQL, it will display an error message.

If it is implemented through the system, it will also not run; it is different if the user is used with an expert admin where the access rights on the table have all access rights so that if data management is carried out, both adding, updating data, or deleting data can be done. With the design of user access rights for managing expert data, school achievement can be more controlled following the designed access rights both from the database side and from the system or program side [13].

Based on the school's expertise mapping site, process modeling, and table relations that have been designed above, the author can design a user interface system for comparison of school expertise to be developed that parents of prospective students can access[14].

4. Conclusions

The authors might derive the following conclusions based on the outcomes of the discussion on the construction of a public high school achievement expert system in Surakarta:

1. The author created an expert system sitemap, search framework, and accomplishment statistics framework for a school achievement expert system[15].
2. The achievement search interface can show specifics of school accomplishments and comparisons of accomplishments from various schools and information on educators and menus to see or download school accreditation certificates or certificates of achievement for educators and students.
3. The statistical interface can provide a graph to show the details of achievement based on the category you choose, and it will show detailed achievement information [16].
4. A database can be created in the school accomplishment expert system, which includes constructing an expert system database table relation, creating a foreign key constraint so that linked data input is not affected by database errors, and creating triggers to validate email input in the table. Educators from the database side
construct access roles or user access roles in accessing the expert database so that data security is maximized in the case of data misuse.

5. The school achievement expert system's results are expected to assist the community in locating information about a school. They can be used as a reference in awarding scholarships to students and educators and determining candidates for the science and technology olympiad.

References


